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TO THE CREDIT OF THE WIRELESS.

Ever since those who go down to the sea in ships began the installation of wireless-telegraph sets, either to satisfy a fad or with a far-sighted belief that in time of emergency they might prove a valuable aid, both those on shore and afloat have been waiting for a real demonstration of the utility of this mysterious, yet reliable, source of communication. Because there was nothing more tangible to the public mind and to the uninitiated than the air through which to project the impulses which could be depended upon to render effective the apparatus designed to receive and translate these impulses, there has been much skepticism as to the value of wireless apparatus aboard ships. During the Russo-Japanese War it was reported that wireless had played an important part in effecting communication between the scouts and the battleship fleets, but still the unbelievers scoffed. Notwithstanding the fact that bulletins were published on incoming and outgoing steamers connecting with the wireless-telegraph stations along the Massachusetts and Long Island coasts, there yet was to be had the definite mind-stirring and mind-impressing lesson which only an emergency of great proportions could teach.

And so it was that some time between Friday night and Saturday morning of last week, the ship Republic, of the White Star Line, which company, by the way, was one of the first to adopt the wireless, was plowing along outbound to the Mediterranean, about twenty-six miles south of Nantucket Shoals, on the coast of Massachusetts, when out of the fog loomed up the steamer Florida, of the Italian Line, and so close was the proximity of the vessels in the dense fog that prevailed that there was no time to avert a terrific collision. The Florida crashed through the side of the Republic, cutting down two cabin passengers and killing instantly four of the crew, impairing the engines, stopping the dynamos, and rendering the ship helpless. The Marconi operator, John R. Binns, a modest hero of British extraction, tested out his apparatus and found that his accumulators were in fine shape and his aerial intact. Immediately after, the ether was throbbing with Hertzian impulses, which whispered to the world that a steamer had been rammed and for all stations to stand by. By all stations, according to the international code of ethics understood and obeyed by all contributing to it, is meant that wherever the message may be picked up, all efforts must be made to render immediate assistance. Shoreward, on the New England coast, at Siasconset, on Nantucket Island, the message was picked up, and back came the response, "All right, old man; where are you?" Away down the ocean lane, proceeding on its way to New York, was the Baltic, a sister ship of the rammed steamer, and her alert op-

erators caught the message, discovered the position of the disabled one, and all speed was made to reach her with the least possible delay. The French steamer, La Lorraine, nearly 200 miles away, and almost within sight of its harbor, caught the whisper, slowed down its engines, whirled around, and then proceeded full steam to the aid of the Republic. In the meantime the operator at Siasconset had sent forth to the world the message of distress, and from every point where assistance could be rendered government tugs, salvage steamers, wreckers and helpers from the office of the White Star Line proceeded immediately to the scene of the accident.

There being danger of the Republic sinking, the passengers were transferred to the Florida, remaining there but a short time, when the Baltic nosed them out of the fog, and the passengers were then retransferred to the giant Baltic, later on proceeding to New York. It is unfortunate that the heroic efforts made by Captain Sealby and his devoted crew, including Binns, the Marconi operator, did not avail to save the Republic, and on Sunday afternoon she sank off No Man's Land, near Martha's Vineyard, Mass.

Of course, it is hardly fair to ascribe all the credit for the saving of the thousand or more souls aboard the two steamers to the work of the wireless, but it is appalling to even consider what might have happened if means had not been available for summoning assistance from far and near. Only a few years ago these ships might have come together, drifted apart in the fog and been lost without anyone knowing the story of the disaster. It was three days after the sinking of the La Burgoyne before this disaster was known to the world. The part that the wireless played in first summoning assistance to the disabled vessels, directing the steering of the fleet coming to their relief, and then keeping the anxious ones informed concerning the progress of rescue, has demonstrated that when its aid was most needed it was ready and sure. Now that the lesson has been thus vividly taught, it is hard to conceive how anyone will again doubt the value and necessity of equipping every ship that floats with this source of communication between itself and the shore and its sister ships of the world's flotilla.

THE CONVENTION OF THE NORTHWESTERN ELECTRICAL ASSOCIATION.

A year ago, when the sixteenth annual convention of the Northwestern Electrical Association was held at Milwaukee, there was some apprehension as to whether the association would survive the splitting up of its organization into several state organizations, and there were many expressions of doubt in regard to the efficiency of the association. The inauguration of the Wisconsin state commission, having jurisdiction over the electric-lighting and street-railway systems, with its promulgation of a policy of extending to the corporations an indeterminate franchise, caused considerable worry, and this, together with the first pangs of an industrial and financial depression, was enough to bring about a feeling of discouragement such as these interests had not been conscious of in many a year.

With these conditions in mind, it is gratifying to note the fine spirit of enterprise and good-will which dominated the entire proceedings of the two days' convention held at Milwaukee last week. Not only were the technical papers presented of a high order of merit, and those presenting them the men best fitted to elucidate the various problems dealt with, but there was evident a satisfaction with the outlook for business and an agreeable concession that the work of the public-service commission meant better times for the public-utility corporations. John I. Beggs, president of the Milwaukee Electric Railway and Light Company, voiced the sentiments of the public-utility operators in Wisconsin and adjoining states when he said that the regulations of the commission meant not only protection to the consumer, but established a bulwark of safety for the corporation. Not in years were the securities of these corporations more stable than at the present time, and, conforming to the regulations suggested by the public-utilities law, there was no reason to fear that the interests of the investor would not be conserved. The matter of indeterminate franchises was no longer a cause for anxiety, as the working out of this idea apparently assured the corporation doing its best to serve its customers that unnecessary and disastrous competition would not be allowed. While the necessity for a more close analysis of cost keeping and more extended forms of accounting might appear to impose a burden on the smaller companies, it would be found that this very analysis and close inspection of accounts would redound to the benefit of these companies, as it would indicate to them where the leaks were, and ultimately bring their cost of production to a minimum, so that the rather paradoxical situation of increasing the profits while reducing the cost to the consumer was a readily attainable end.

In this connection it is interesting to note the suggestions which the Public Service Commission of New York has made in its second annual report to the state legislature. The legislation called for can hardly be called corrective, and is entirely on the side of the corporations. If carried out it will make the matter of the investment of large funds more practically certain of decent returns, and insure to the investor the conservation of his capital and an appreciation of his usefulness to the community at large.

This is also the case in Indiana, where, on Tuesday of this week, a special meeting of the Indiana Electric Light Association was held to discover the possibilities of legislation now pending before the Indiana Legislature. This legislation will probably turn over to the State Railroad Commission the functions and authority coordinate with that of the public-utility commissions of New York, Massachusetts and Wisconsin, including the regulation of the electric-lighting companies. Thomas McReynolds, the president of the association, in his opening address, said that if there is really a demand for creating a public-service commission, the people and the legislature should understand that the necessity for such a law does not come from the sole purpose of protecting the public against the corporation, but is for the common good of all. Henry L. Doherty, than whom no one is better fitted to discuss this subject, said that the reason why there had been a misunderstand-

ing between the corporations and the public was because the corporations had not properly educated the public to an appreciation of the great work they were doing. By its very nature the public-service corporation gives to the man of small means an opportunity to share in a business which requires an investment which would otherwise be entirely outside of his financial ability.

Reverting again to the convention of the Northwestern Electrical Association, one of the features was the discussion on tungsten lamps. The central station is now adopting an attitude of increasing the use of the higher-efficiency filaments, realizing that in few cases does this mean a reduction of current consumption, and better satisfies the consumer by giving him more light for the same expenditure, also assisting the company to supply an increasing network without adding to the present generating equipment. Concerning the status of the carbon lamp, it is the general consensus of opinion that, for some time at least, there will be a considerable demand for the older type of incandescent. It may be remarked, however, that so impressed have central-station managers become with the possibility of pushing the sales of higher-efficiency lamps, that it would not be surprising if the operating companies, in the large cities at least, should adopt the policy of renewing lamps of sixteen candlepower and over with metallized-filament and metallic filament incandescent units, thus discouraging the continued use of the carbon-filament incandescent.

RAILROADS AND ELECTRIC RAILWAYS IN MASSACHUSETTS.

The indications are that electric railways and steam railroads in Massachusetts will remain under independent control and operation for some time to come, judging from a special report submitted this week by the Railroad Commission to the Legislature. The board reviews the history of both kinds of transportation systems in a thorough way, and points out that the policy of the state has never been one of definite encouragement to the combination of distinctly different systems occupying special and separate fields. The evidence of recent years is that the electric railways are still undergoing development and expansion, and that both systems are fulfilling their separate functions satisfactorily. While it is true that if some of the weaker electric railways were absorbed by the stronger steam roads, the board points out that such a policy would lead ultimately to the control of all the transportation interests in the State by a very few hands, and it feels that Massachusetts is not yet ready for an experiment of this character.

The status of the so-called electric railroad, operating on a private right-of-way very largely, and under recent laws giving such roads a more important status than the ordinary trolley line running in the streets or highways, is as yet indeterminate by experience. One of these lines has been authorized between Boston and Providence, but on account of the financial depression, has been held in abeyance temporarily. Just what the relations of this type of road will be to a future electrified steam system, is difficult to say.

ELECTRIC VERSUS GAS LIGHTING.

Electric lighting, with its absence of combustion, has always been superior to that with coal gas in its relation to the public health, and recent practice in gas manufacture makes it still more desirable to use electricity for all interior illumination.

At its best, lighting with coal gas delivers carbon dioxide and hurtful sulphur dioxide into the air of living rooms, and very frequently corrosive sulphuric acid is also liberated.

Of these products of gas combustion, the sulphur compounds are most to be feared, and factors in gas production tend to largely increase the amount of these compounds per thousand feet of gas. To lower the cost of manufacture, cheaper grades of coal that contain more sulphur than those formerly in use are being resorted to in some cases, and this increases the quantity of sulphur in the crude gas as it comes from the retorts. Then again, retort temperatures employed to carbonize coal have been on the rise for some years, and this rise carries with it larger proportions of sulphur in gas from the same coal. On this point, it has been shown by experiment with a certain coal that a temperature of carbonization which yields 11,620 cubic feet of gas per ton produces sixty-five per cent more sulphur, not including sulphuretted hydrogen, per thousand cubic feet of gas, than a temperature which yields only 9,431 cubic feet of gas per ton of coal.

With both the quality of the coal and the method of carbonization giving increased percentages of sulphur per thousand feet of crude gas, as it comes from the retorts, lime purification is being abandoned at many plants, so that all of the sulphur not in the form of sulphuretted hydrogen is allowed to remain in the gas distributed to consumers. The importance of these changed conditions from the standpoint of sulphur quantity is illustrated by the figures for one of the London (England) gas companies, which supplied gas with a maximum of 20.7 grains of sulphur per 100 cubic feet, during the first three months of 1905, when lime purification was in use, and gas with a maximum of 78.5 grains per 100 cubic feet, during the first three months of 1906, when lime purification had been abandoned.

A recent test of Edinburgh (Scotland) gas yielded at the rate of one ounce of sulphuric acid per 18,421 feet, on combustion.

The logic of facts like these points to the increased substitution of electric light for gas in interior illumination, where there are human beings to be injured by sulphur dioxide and sulphuric acid, and furniture, draperies and paintings to be eaten by the latter.

It does not follow that the total consumption of gas is to decrease, but merely that its use is to shift more and more from lighting to cooking and heating. A long distance has in fact been traveled already in the direction of this change, and the greater part of the increase in gas consumption during recent years, for some plants at least, has been due to its use as fuel rather than light, so that many plants now sell sixty to eighty per cent of their total output for heating purposes.

The Seventh International Congress of Applied Chemistry.

London is to be the scene of a notable gathering of chemists in May of the present year, when the seventh International Congress of Applied Chemistry will meet under the patronage of King Edward VII, and of the Prince of Wales, who is expected to open the Congress and to address the 3,000 or more members gathered from all the countries of the world.

The first Congress of this kind was held in Brussels in 1894 and was organized by chemists dealing especially with the sugar industry, for the purpose of introducing uniform methods of valuation and analysis in that industry. This gathering was a success, and at the next meeting in Paris, held in 1896, the aims and scope of the Congress were much widened.

Since that year the gathering has grown in magnitude and importance, and it now embraces chemists from all countries of the world, and covers all departments of chemical industry. At Berlin, in 1903, a total membership of 2,533 was registered, and the expenses of the gathering ran up to $75,000, while at Rome, in 1906, the total was only slightly reduced, being 2,375, a result no doubt due to the distance of the Italian capital from the other capitals of Europe.

The work of the Congress is now carried on in seventeen Sections and Subsections, each with its own staff of officials. In these subdivisions the various papers presented are read and discussed by specialists in each branch of applied chemistry. The official languages of the Congress are English, French and German. The organization of the Congress is, in fact, modeled very much on the lines of the British Association; but the Congress is cosmopolitan in character and no attempt is made to cover other branches of science or industry, than those indicated by its title.

The list of Sections and Sub-sections, with their chief officers (for the London Congress), is given in the table herewith.

A journal is published daily during the meeting of the Congress giving the programme for the day, a short summary of the papers read and discussions of the previous day, and a list of visitors, with their local addresses. The full official report of all the papers and discussions is published about a year after the close of the Congress, and is now a most important and voluminous publication. The report of the Berlin Congress occupies four volumes of 1,000 pages each, while that of the Rome Congress is nearly as bulky and extensive.

Special lectures and addresses have been arranged during the London Congress week, at which all the sections will combine. Professor Haller, of Paris, Prof. Otto de Witt, of Berlin, Professor Patermo, of Rome, and Sir Boverton Redwood, of London, have consented to deliver lectures upon the subjects of which they have made a special study.

In the way of evening entertainments there have been arranged a soiree at the South Kensington Natural History Museum, a banquet at the Crystal Palace, a reception at the Mansion House by the Lord Mayor, and one or two smoking concerts. It is also hoped that the King will receive the visitors at Windsor Castle one afternoon during the meeting.

The London meeting of the Congress is therefore likely to be a record one, both in number and importance. Further information concerning it may be obtained from the Hon. Secretary Wm. McNab, at 10 Cromwell Crescent, South Kensington.

Honorary President, Sir Henry E. Roscoe, F. R. S.
President, Sir William Ramsay, K. C. B., F. R. S.

Section.	President.	Vice-President.	Honorary Secretary.
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2. Inorganic Chemistry	Dr. Ludwig Mond, F. R. S., F. I. C.	Sir J. Dewar, F. R. S., F. I. C.	Dr. E. F. Armstrong.
3. (a) Metallurgy and Mining.	Sir Hugh Bell, Bart.	Prof. Henry Louis, F. I. C.	D. A. Louis, F. I. C.
(b) Explosives.	Sir A. Noble, Bart., K. C. B., F. R. S.	Capt. T. G. Tulloch.	J. E. Petavel, F. R. S.
4. (a) Organic Chemistry.	Prof. W. H. Perkin, F. R. S., F. I. C.	Prof. F. S. Kipping, F. R. S., F. I. C.	Dr. G. T. Morgan, F. I. C.
(b) Physiological.	Prof. W. H. Perkin, F. R. S., F. I. C.	Dr. Arthur Gamgee, F. R. S.	Dr. Aders Plimmer.
(c) Allied Industries	Prof. R. Meldola, F. R. S., F. I. C.	Prof. A. G. Green, F. I. C.	Dr. J. C. Cain.
5. Sugar.	Sir Richard Garton.	Ed. Tate.	Dr. L. T. Thorne, F. I. C.
6. (a) Starch.	Dr. Horace Brown, F. R. S., F. I. C.	Sir Walter Palmer, Bart.	J. L. Baker, F. I. C.
(b) Fermentation.	J. Gretton, M. P.	Prof. Adrian J. Brown, F. I. C.	A. R. Ling, F. I. C.
7. Agriculture.	Rt. Hon. Lord Blyth.	Dr. J. A. Voelcker, F. I. C.	A. D. Hall.
8. (a) Hygiene.	Sir J. Crichton Brown, F. R. S.	Prof. H. R. Kenwood.	Dr. K. Menzies.
(b) Pharmaceutical Chemistry.	N. H. Martin.	J. C. Umney, F. I. C.	E. F. Harrison, F. I. C.
(c) Bromatology.	R. R. Tatlock, F. I. C.	E. J. Bevan, F. I. C.	C. H. Cribb, F. I. C.
9. Photographic Chemistry.	Sir W. de W. Abney, K. C. B., F. R. S., F. I. C.	Sir H. Trueman Wood.	H. Chapman-Jones, F. I. C.
10. Electro-Chemistry.	Rt. Hon. Sir John Brunner, Bart.	Dr. G. T. Beilby, F. R. S., F. I. C.	Dr. F. Mollwo Perkin.
11. Law, Political Economics and Legislation with reference to Chemical Industries.	Rt. Hon. Lord Alverstone, G. C. M. G., F. R. S.	Rt. Hon. Sir J. Fletcher-Moulton, F. R. S.	Rt. Hon. Viscount Tiverton.

Porcelain as an Insulating Material from a Physico-Chemical Standpoint.

The chief requirements of a good and reliable insulating material are that it has a high electrical resistance, is little hydroscopic, is fireproof and that it has a long life and is mechanically strong. There is no material which possesses all these qualities in an ideal sense, but the best material at the present time is undoubtedly porcelain. The chief substances of which porcelain is composed are feldspar, quartz and kaolin, also called porcelain earth, the latter being the most important. If porcelain earth is burned alone the result is a white, hard, porous substance which is highly hygroscopic and unsuitable as an insulating material. Feldspar, when heated above 1,200 degrees, produces a glass of dull, milky appearance, caused by numerous small air bubbles. If heated still higher it has the capacity of fusing quartz and forming in combination with the same a homogeneous flux. The glaze of porcelain is nothing but a glass flux produced from the burned porcelain mass itself by the addition of other fluxes, as feldspar, chalk or magnesia. The processes that take place in the furnace during the burning of porcelain have recently been made the subject of an exhaustive scientific investigation by the author of this article, Dr. A. Zoellner, and his results are summarized as follows: 1. Porcelain, especially that employed for high-tension insulators, must not be burned below a certain temperature (1,400 to 1,450 degrees Centigrade), because at these temperatures the most important chemical and physical changes take place in the mass. 2. The air bubbles in porcelain are the cause of glow and brush discharges and of those breakdowns that are not due to faulty porcelain in itself. 3. The limits of the capacities of porcelain as an insulating material are not yet ascertained. They will be determined by a systematic test of masses of different composition, and, furthermore, by experiments to ascertain to what degree air bubbles are avoidable.—*Translated and abstracted from Electrotechnische Zeitschrift (Berlin), December 31.*

OPPORTUNITIES FOR ELECTRICAL MANUFACTURERS IN SOUTH AMERICA.

FROM THE REPORT OF C. M. PEPPER, SPECIAL AGENT OF THE UNITED STATES DEPARTMENT OF COMMERCE AND LABOR.

BY H. G. WARD.

From time to time the Department of Commerce and Labor sends its special agents to various parts of the world to investigate the possibilities for increasing American trade in those countries. One of these trained special agents, Charles M. Pepper, was recently sent to report on the trade conditions on the west coast of South America, and the results of his investigations have just been laid before Congress. The following excerpts from the Pepper report are of interest to the electrical world:

The commercial area of the west of South America includes the 3,100 miles of sea line from Panama to Valparaiso, and the country back of it, which consists of the valleys and plains of the intermountain region and the slopes of the Andes system. The population within this trade area comprises: Colombia, 600,000 inhabitants; Ecuador, 1,500,000; Peru, 3,500,000; Bolivia, 1,816,000; and Chile, 3,250,000, or a total of 10,666,000. This area has an international trade of $250,000,000 and upward annually. The proportion of the United States in this trade is approximately $50,000,000, with the balance usually in favor of the countries of the southern continent. Since the construction of the Panama Canal was begun by the United States it has been apparent that there is a widening field in this commercial territory for the output of American factories. The United States already has shared in the growth, but there are broader opportunities. In addition to the railway and mining enterprises, special note should be made of the possibilities for utilizing the waters of the Andes for hydroelectric power.

The installation of electrical machinery may properly be characterized as one of the future great industries of the west coast. The scarcity of fuel explains this prospect, though scarce fuel would not give encouragement to electrical development unless the natural source also existed. This is found in almost unlimited quantities in the waters of the Andes. There is hydroelectric power capable of indefinite development, differing only in different regions. This power already is utilized to a limited degree for lighting, trolley traction, and light manufacturing. From Ecuador to Chile all the larger municipalities have electric lighting, but there are many small towns in which it is yet to be introduced. Its use for private residences, stores, etc., is capable of great extension.

In Ecuador the street-car systems of Quito, the capital, and Guayaquil are being transformed into trolley systems. At Quito the power is near at hand, but for Guayaquil it has to be brought from a distance. A promising project in this country is to bring the power by long-distance transmission from the Chimbo River, fifty-five miles, to Guayaquil, and utilize it for manufacturing industries, in addition to traction and lighting.

In Peru the most extensive employment of electricity is that which is obtained from the Rimac River. The chief enterprise is one which brings the power from Chosica, thirty miles, to Lima, and employs it for street-car companies, for lighting, and for small manufacturing. Most of the cities have electric-light systems, and a few of them also traction systems operated by electricity. In its broadest operation—that is, for transportation—Peru offers the most inviting field in the Central Railway, with its four-and-one-half-per-cent grades and its numerous other engineering problems. The project of operating certain sections of this railway by electricity, so long as neither definitely accepted nor definitely rejected by the Peruvian Corporation, may be said to be open.

Peru offers also a prospective field for the utilization of electricity on a large scale in smelting. The Cerro de Pasco Company's investigations of the power available in two rivers, thirty and fifty miles distant, have predisposed the officials to follow up the subject. No promise is held out of immediate results, yet there is the probability which comes from the economic saving that may be effected in operating the smelters and other works at this great altitude.

In Bolivia the first utilization of electricity on a large scale may be in the mining industry. The encouragement comes from the necessity of finding some substitute for the high-priced fuels. Its application to the railway system is a matter of the more remote future; but if the plans of the Bolivian government are carried out for a railway from La Paz through the Yungas region to the navigable waters of the Beni River, electricity, in the opinion of competent experts, will be the motive power. Six per cent grades will be required on this line, and they can be overcome by electrical power easier than by any other means.

The use of electricity in Bolivia at present is on a limited scale. La Paz has an electric-lighting system and may install a trolley. In the Corocoro mining district hydroelectric power can be obtained over a sixty-five-mile transmission, and it is available within a shorter distance of the Oruro mines. The estimated reduction of the cost per horsepower per hour for the mines by the use of electricity is from three to ten cents, according to the location of the mine and the fuel used. Oruro has electric lights, and a few other cities have made contracts for them. Electricity would also be of great benefit to light manufacturing industries, since fuel is so high-priced.

In Chile electricity is pretty generally employed, both for traction purposes and lighting, while there is some utilization of this force in manufacturing. The two lines of future development are for manufacturing and railways. The leading project of a railway character is for electrifying the line from Valparaiso to Santiago, but there are numerous other enterprises. An important German hydroelectric enterprise is that for the Maipo River, near Santiago.

In the general class of electrical apparatus the extension of the telegraph and telephone systems is to be noted. This is constantly going on. New telephone exchanges are being installed in many cities, while there is a notable tendency toward long-distance lines. The extension of the telegraph lines and the market for copper wire and apparatus is twofold. There is the growth which is due to the building of railways, and there is the effort of the different governments to enlarge their systems so as to bring remote regions in connection with the centres of population. Bolivia, Peru and Ecuador are all extending their telegraph lines toward the Amazon basin. It is also worth noting that several of the governments interested have given concessions for the installation of wireless systems in the vast interior river regions.

The three leading electric companies in the United States are represented in all the west coast countries and have been aggressive in seeking the business. The chief competition is from the German companies, and this includes telephone and similar apparatus.

ALTERNATING CURRENTS AND THEIR APPLICATIONS.

BY EDSON R. WOLCOTT.

CHAPTER IV. (PART I.)—TRANSFORMERS.

ESSENTIALS OF TRANSFORMER CONSTRUCTION.

The principles of the transformation of an alternating current of a given voltage into one of any desired voltage have already been considered.

A transformer consists essentially of two electrically distinct circuits linked by an iron core or magnetic circuit. An alternating current flowing through one of the coils generates an alternating magnetic flux which circulates through the iron core and sets up in the secondary winding an alternating-current electromotive force of the same frequency. The ratio of the voltage of the inducing current to that of the induced current is the same as that of the number of primary to secondary turns.

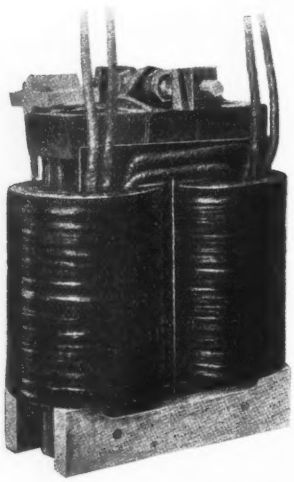


FIG. 78.—WINDING OF TRANSFORMER WITH CIRCULAR COIL, SHOWING LOW-TENSION LEADS.

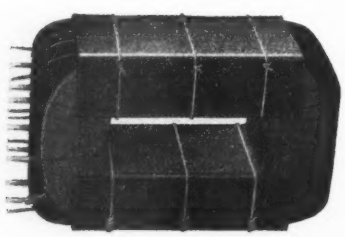


FIG. 81.—ASSEMBLED TRANSFORMER COILS.

CORE-TYPE TRANSFORMER.

There are several methods of winding the conductors on the iron magnetic circuit. Fig. 78 is an illustration of a common type of transformer. The two legs of the iron core are each wound with concentric primary and secondary coils. The two primary coils and the two secondary coils are connected together, respectively, as shown in the illustration. Fig. 79 shows the cruciform-section core, with the two sets of coils removed. In some cases the coils are of rectangular rather than circular form.

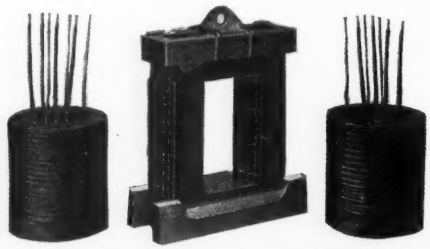


FIG. 79.—COMPLETED CRUCIFORM CORE AND CIRCULAR COILS.

SHELL-TYPE TRANSFORMER.

Another construction, illustrated in Fig. 80, is that of the shell-type transformer. The core is built up of laminated punchings. Each layer of lamination is reversed in direction with reference to the preceding layer, thus giving a continuous magnetic path of low reluctance. The cores are built up around the windings, as shown in the illustration.

The assembled coils for this transformer, before being set up with the magnetic circuit, are shown in Fig. 81, while the successive stages of winding the coils are shown in Fig. 82.

TYPE H TRANSFORMER.

Still another type of transformer is given in Fig. 84. The high-tension coils

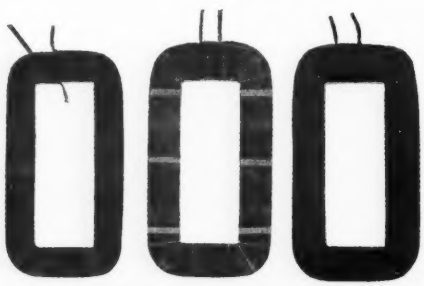


FIG. 82.—STEPS IN THE BUILDING OF AN AIR-BLAST TRANSFORMER COIL.

shown, with the case removed, in Fig. 83. The coils are wound around a centre leg, and the magnetic circuit is completed by yokes on four sides.

MOUNTING TRANSFORMERS.

A view of the top of a transformer, showing the method of insulating the terminals and the connections for fuses, is given in Fig. 84. The high-tension coils are usually divided into two parts, so that they can be connected either in series or in parallel, and thus be used on circuits of 1,100 and 2,200 volts.

Particular care must be taken in the construction of the coils to see that they are properly insulated, not only from each other, but that the separate turns and coils are insulated.

The laminations of the iron core are also usually coated with enamel, which is baked on at a high temperature. This decreases considerably the core losses due to the eddy currents which would otherwise circulate in the iron core.

FIG. 80.—ASSEMBLED CORE AND COILS.

Transformers are usually enclosed in an iron case filled with oil, which assists in maintaining the insulation and protects it from the effects of moisture.

The method of mounting transformers, such as are used on lighting circuits, is shown in Fig. 85. The high-tension side of the transformer is shown brought out in the rear and connected to the upper line having the smaller wires. On the same cross-arm which carries the high-tension line, and connected to the latter, are shown two fuse blocks.

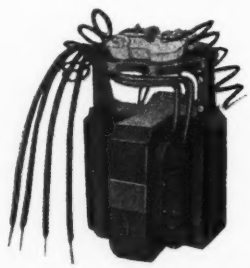


FIG. 83.—TRANSFORMER CORE AND COILS.

With the increased use of high-voltage transmission lines and units of large ca-

pacity, there have come into use transformers of great size compared with those employed a comparatively few years ago.

COOLING OF TRANSFORMERS.

Transformers having a capacity greater than 500 kilowatts, and in some cases those above 100 kilowatts, have special arrangements for cooling. Although the

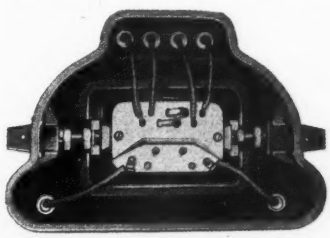


FIG. 84.—INTERIOR OF CASE WITH CORE IN POSITION.

losses of these large transformers are relatively small, being usually not more than two per cent, still this amounts to considerable energy to be dissipated, with transformers having a capacity of several thousand kilowatts. All of the losses—those in the iron due to hysteresis and eddy currents, which are called the iron losses, as well as those due to resistance in the primary and secondary coils, known as the copper losses—appear as heat. Some arrangements for cooling are therefore necessary in the case of transformers of large capacity.

WATER-COOLED TRANSFORMERS.

One method of cooling is by the use of water pipes, as illustrated in Fig. 86.

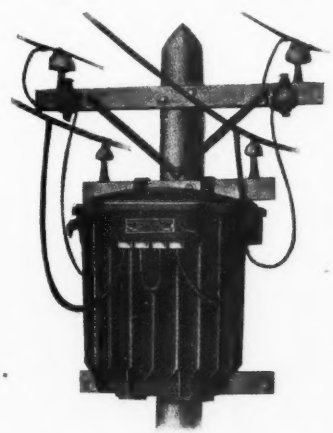


FIG. 85.—TRANSFORMER INSTALLED ON POLE.

Several oil-insulated, water-cooled transformers having a capacity of 2,250 kilowatts each at 22,000 volts, are shown in Fig. 87. These are in use at Niagara Falls, N. Y.

AIR-COOLED TRANSFORMERS.

Another method of cooling is by means of an air blast. This requires that the insulation be impervious to moisture and that the windings and magnetic circuit be so built as to be easily ventilated. In Fig. 88 is shown a longitudinal cross-section view of an air-blast transformer, the path of the air being indicated by the arrows. Air is usually supplied to transformers of this type by means of a blower, which is run by a small motor. The pressure of the air supplied for cooling transformers depends on the size of the unit, increasing for the larger apparatus, since the air ducts are longer, and consequently offer greater frictional resistance. High-voltage transformers of the same capacity as those of lower voltage are larger, and so usually require greater air pressure.

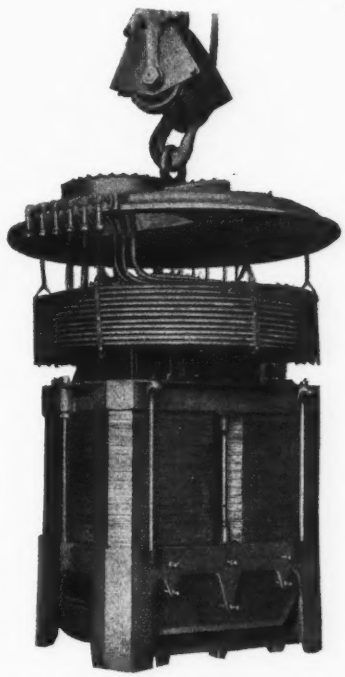


FIG. 86.—A LARGE OIL-INSULATED, WATER-COOLED TRANSFORMER.

The blast pressure varies from one-half ounce to one ounce for transformers having capacities up to 3,000 kilowatts and voltages up to 33,000.

A transformer of this type having a capacity of 2,750 kilowatts is made to operate continuously at full load with a temperature rise not exceeding thirty-five degrees Centigrade, and continuously at one-quarter overload with a rise not greater than fifty-five degrees Centigrade. It is also claimed that it will operate at fifty per cent overload for an hour with a temperature limit of sixty-five degrees Centigrade.

As to whether water or air cooling is better has not been definitely decided. Each method has some advantages.

An Electromagnetic Explanation of the Aurora.

According to the common theory which is assigned for the explanation of the aurora borealis, or "northern lights," the luminous streams which are seen on these occasions are taken to be electrical discharges through the rarefied strata of the

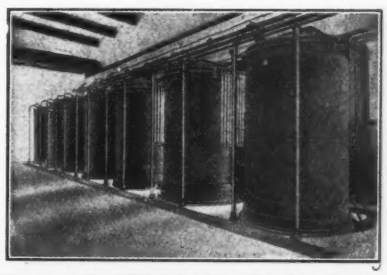


FIG. 87.—OIL-INSULATED, WATER-COOLED TRANSFORMERS.

atmosphere. The position of the bands is entirely within the limits of the gaseous envelope of the earth, and a distinct parallax can be obtained by two observers, separated by a short distance.

Reducing the hypothesis of the electromagnetic character of the aurora to a calculable position, P. Villard in a recent paper published in Comptes Rendus, has undertaken to estimate the electrical quantities required to secure the observed effects.

As a result of experiment it has been noted that a closed circuit which is partially made up of ions is the seat of an

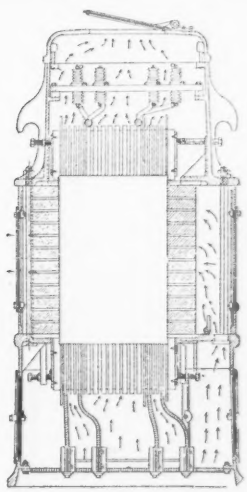


FIG. 88.—SECTION OF AIR-BLAST TRANSFORMER, SHOWING AIR-DUCTS.

electromotive force when caused to rotate around the axis of a magnet. The rotation of the conducting surface of the earth with the ionized atmosphere above it forms an analogous case in which there is an electromotive force of from 100,000 to 150,000 volts directed from the equator to each of the poles.

New Legislation Requested by New York Public Service Commission.

The second chapter of the annual report of the Public Service Commission of the First District to the Legislature discusses the necessity for new legislation as to rapid transit in New York city, makes special recommendations for new legislation and points to the present lack of action in the Board of Estimate in authorizing expenditures for new routes. The recommendations are:

"A constitutional amendment exempting from the ten per cent debt limit bonds for the construction of rapid transit lines, when, so far and so long as such rapid transit lines shall be self-supporting.

"An amendment to the Rapid Transit Act providing that operating contracts for extensions of rapid transit lines may be made to terminate at the same time as the original operating contract, this commission having the power in conjunction with the Board of Estimate and Apportionment to fix the terms, conditions and compensation and to readjust the same each twenty years thereafter. Such phraseology should be used as will make it clear that extensions proceeding beyond terminals are alone intended.

"An amendment to the Rapid Transit Act which shall give this commission the power in conjunction with the Board of Estimate and Apportionment to allow the construction and operation of rapid transit lines by private companies upon payment of part of the earnings to the city, or other proper terms and with a reservation to the city to purchase at any time after a certain period not more than twenty years and without any payment for the franchise itself.

"An amendment to the Rapid Transit Act which shall give this commission the power, in conjunction with the Board of Estimate and Apportionment, to grant franchises to existing corporations owning rapid transit lines, to construct and maintain extensions or to lay and maintain additional tracks on the whole or part of their routes, with a reservation to the city of the privilege to purchase at any time after a certain period of not more than twenty years and without any payment for the franchise itself. Such phraseology should be used as will make it clear that extensions proceeding beyond terminals are alone intended.

"An amendment to the Rapid Transit Act making it possible for this commission, in conjunction with the Board of Estimate and Apportionment, to make operating contracts for a longer period than twenty years or else to make operating contracts terminable at any time after a certain period of not more than twenty years, with a provision that the equipment shall be purchased at a fair price by the city at the termination of the contract.

"An amendment to the Rapid Transit Act rescinding the requirement that the operator must pay interest and a specific annual sum for sinking fund on the entire cost of a rapid transit line, and permitting the commission and the Board of Estimate and Apportionment to adapt the operating contract to the specific needs of each case.

"The commission favors permitting the cost of rapid transit lines to be assessed in whole or in part on the lands benefited, but it is not yet prepared to recommend a definite method.

"Greater freedom should be given to those who have to arrange the terms of operating contracts, and so long as the concurrent action of the Board of Estimate and Apportionment and a state board like the Public Service Commission is requisite, there is little danger that the terms will be made more lenient than the situation actually demands. These two authorities should be allowed to make the best possible terms with a private company for operating and also to undertake the municipal operation if no private operator can be secured upon reasonable terms or if municipal operation seems preferable. The principle of acquiring interest and provision for a sinking fund would ordinarily be observed, but the city ought not to be bound to take an operator upon certain terms specified in advance or else be compelled to adopt muncipal operation."

The commission advocates the taking of bonds issued for new subways out of the city's debit limit. It is pointed out that it has been proved that subways are self-sustaining and that therefore the constitution should be so amended as to exempt from the city's indebtedness corporate stock sold for the construction of new subways.

Concerning the attitude of the Board of Estimate toward building of new subways, the report says:

"Owing to the refusal of the board to act, subway building has been held up over seven months, and the day when the citizens of New York will be transported in decency and comfort has thereby been placed further and further into the future. Several miles of new subway would today be under construction if the Board of Estimate and Apportionment had acted upon the contracts before it had authorized an expenditure of less than $3,000,000. The Public Service Commission has exercised every function bestowed upon it to secure the construction of new routes and is in no way responsible for the fact that no work has been started during the last year upon new routes."

The Minnesota Electrical Association.

The second convention of the Minnesota Electrical Association will be held at the Nicollet Hotel, Minneapolis, Minn., March 18 and 19. The first meeting of this association was held last February.

One of the features of the meeting will be a paper by Prof. George D. Shepardson, of the University of Minnesota, and other papers are announced as follows: "Use of Tungsten Lamps for Street Lighting," H. J. Gille, Minneapolis; "Tungsten Lamps from the Illuminating Engineer's Point of View," J. R. Cravath, Chicago; "Methods of Building Up a Day Load in Small Central Stations," A. Wagner, New Ulm; "Proper Method of Purchasing and Using Coal," Ludwig Kemper, Albert Lea; "Heating Appliances as an Aid in Developing a Day Load," E. L. Callahan, Chicago.

There will also be a report by the Committee on Fire Insurance, an address on taxation of public-service corporations, by a member of the Minnesota Tax Commission, and a complimentary dinner on March 18, followed by a theatre party. The electrical manufacturers, jobbers and supply dealers of the Twin Cities will make arrangements for the latter features.

The president of the association is W. R. Putnam, of Red Wing, and the secretary, Ludwig Kemper, Albert Lea.

Experimental Side-Door Subway Train.

An experimental subway train with side doors, which the Public Service Commission ordered the Interborough Rapid Transit Company of New York city to equip and put into service many months ago, will be run for the first time on February 5.

The company has completed one of the trains of eight cars, after having experimented for months with a pneumatic door-opening device.

The car to be used is the result of a report made by Bion J. Arnold, of Chicago, to the Commission, and if it is a success in New York the company will be required to change all the cars now in use.

The Bonham and Weber Smoke Recorder.

The keen interest with which the authorities of large and small cities are directing the work of city inspectors toward the detection of unnecessary production of smoke by factories and buildings has necessitated a close watch in firing, so as to avoid fines and other penalties. A device which would automatically indicate to the engineer or fireman in charge of a plant the amount of smoke escaping from the stack, and which would also form some record of the smoke escaping during a day's run, would be of the greatest value in keeping down the production of smoke, and would also tend toward more economical firing, and at the same time establish a clean bill of health for the careful engineer. At the present time, no matter how carefully an engineer may train his firemen, there may be a time occasionally when, under extreme necessity, quick fires are made, and in bringing up the boiler pressure more smoke than usual escapes from the stack. If it so happens that an alert inspector is in the vicinity, the engineer of the plant may have to assume a good deal of a burden in proving that the smoke nuisance in his case is not a regular thing.

W. R. Bonham, a well-known member of the electrical fraternity in Chicago, and western manager of the Sterling Electrical Manufacturing Company, and William L. Weber, an engineer of Chicago, have invented an automatic smoke indicator and recorder which it appears will do just the work required of it. In the breeching, just before it enters the stack, a perforated ring of piping is introduced, which takes out a small amount of the gases and other products of combustion that make up a fair sample of the contents of the breeching throughout its area. This ring is connected to a small pipe, to which is attached a small blower. The pipe is led around to the boiler front, terminating in a miniature smokestack on the firing floor. The draft in the pipe is carefully regulated in comparison with that of the stack, so that if any smoke is escaping from the big stack, the indication will be recognized in the boiler room in exactly the same proportion. The device goes further than this, however, in that the fireman can detect the escape of smoke a minute or so before it reaches the top of the stack. He can at once adjust his dampers or otherwise stop the smoke.

The pipe from the breeching can also be conducted to the office of the chief engineer or manager of the plant on its way to the fireman's floor, where it passes through a glass bowl interpolated in the pipe, and in this way a fair indication of the volume of smoke can be had at a glance.

Provision is also made for recording the smoke escaping from the stack in twenty-four hours. A jet is taken off from the little pipe in the boiler room, and this impinges on a tape or properly marked disc moved by clockwork. This record may be chemically prepared or covered with some sticky substance, which will hold mechanically the particles of carbon forced upon it by the jet.

Many other applications of the device are obvious, and it is said to have found high favor with a large number of engineers in Chicago.

Computer in the Supervising Architect's Office.

The United States Civil Service Commission announces an examination February 24 and 25 at the usual places to secure eligibles to fill a vacancy in the position of computer (male), $1,600 per annum, in the office of the Supervising Architect, Treasury Department, and similar vacancies as they may occur in that office.

The examination will consist of the following subjects about equally weighted: Materials and construction, involving knowledge of materials, principles of architecture and methods of construction; specifications and contracts, training and experience. Applicants must indicate in their applications that they have had a good general education and not less than two years' experience in practical architecture work and in the writing or interpretation of specifications, etc., either with architect or contractor engaged in the erection of first-class buildings. Age limit, twenty years or over on the date of the examination. Applicants should at once apply to the United States Civil Service Commission, Washington, D. C., for application form 1312.

Underwriters' Association's Electrical Committee.

The date of the meeting of the Electrical Committee of the Underwriters' National Electric Association has been fixed for Wednesday and Thursday, March 24 and 25, at the rooms of the New York Board of Fire Underwriters, 32 Nassau Street, New York city. The sessions will begin at 10 o'clock on Wednesday morning.

Chicago Electric Club Hears About Electricity in the Navy.

In a talk before the weekly meeting of the Electric Club of Chicago, held in the café at the Electrical Show, Wednesday, January 20, Lieutenant Commander Witherspoon of the United States Navy, in charge of the naval exhibit in the Coliseum Annex, contrasted the increased use found for electricity aboard a modern man-o'-war since the days, twenty-five years ago, when he was a student at the Naval Academy.

The electrical equipment of a modern battleship, he said, is rightly esteemed the most important part of its complicated mechanism. In appreciation of this the dynamo room is one of the most carefully protected parts of the vessel, being enclosed in water-tight compartments and shielded by special armor.

Indeed the use of electricity in the Navy has contributed to America's splendid gunnery record for accurate and rapid firing. This result is largely secured by the employment of electric rammers which enable the gun to be loaded, discharged and cleaned while a continuous aim is being maintained. The electrical operation of turrets, magazines, ammunition hoists, etc., has made a facility of maneuvering possible that could never be obtained otherwise.

Portable ventilators electrically driven, which can be placed where needed in the lower decks, have made in many hitherto uninhabitable parts of the vessel an atmosphere as pure and fresh as the ocean air.

The telephone systems aboard ship have important functions in transmitting orders, giving ranges, etc. Fire alarms in the magazines and water alarms in the bulkheads automatically insure the safety of the ship. Wireless telegraph and telephone systems as means of intership and inter-fleet communication are increasing in the number and effectiveness of installations.

Commander Witherspoon was given a rousing vote of appreciation after he had closed his brief address with an expressed wish, on the part of the Navy, that electrical contracts in the future may be more generally awarded to western companies. At the present time few bidders in the interior offer to undertake this class of work.

W. N. Matthews, of W. N. Matthews & Brother, St. Louis, who was a companion of Commander Witherspoon on several cruises a number of years ago, was next called upon and responded with some sea stories.

The Chicago Electrical Show.

Closing Week of the Fourth Annual Exhibition Under the Auspices of the Electrical Trades Exposition Company, at the Coliseum, Chicago, January 16-30.

In point of attendance and interest manifested both by exhibitors and visitors the fourth annual Electrical Show, held at the Coliseum, Chicago, from January 16 to 30, under the auspices of the Electrical Trades Exposition Company, was entirely satisfactory. Up to the closing night popular interest was maintained, and the exhibitors announce that there was little difficulty in attracting and holding the attention of all who came; and it is particularly gratifying to note that the out-of-town representatives of central stations, telephone and telegraph companies and street-railway systems formed a large part of those who came to witness this great demonstration of electrical appliances.

During the two weeks of the show there were many special features which attracted the out-of-town visitors. Of course everybody who possibly could be there was in attendance on the opening night, and many faces long familiar in the electrical field were seen. On Monday, January 18, souvenirs in the shape of Bilikin pins were distributed, and on Tuesday, January 19, a special effort was made to render the remarkable United States Navy exhibit of particular interest to army and navy men. On Wednesday, January 20, the Chicago Electric Club listened to an address by Lieutenant-Commander Witherspoon on the use of electricity on the modern battleship, and on Thursday morning a large delegation from Louisville, Ky., attended the exhibit in a body. On Friday, January 22, the members of the Northwestern Electrical Association were in attendance, and during the day and in the evening there were many gatherings in connection with the meeting of the Chicago Section of the Illuminating Engineering Society. Saturday, January 23, was designated as Students' Day, and Sunday was a day of rest, not a single exhibitor being in attendance at the Coliseum.

On Monday, January 25, souvenirs were distributed, and Tuesday was made especially attractive for the telephone men. On Wednesday evening there was a grand rejuvenation of the Sons of Jove. On Thursday evening the Thomson-Houston reunion was held, the addresses being preceded by an informal dinner early in the evening.

Popular concerts were rendered by John C. Weber and his famous band, and Miss Blanche B. Mehaffey was the soloist this year, entertaining the visitors afternoon and evening with her rendition of classical and popular songs. The decorative scheme and the general nature of the exhibits were described very fully in the issues of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for January 16 and January 23. These issues also contained a comprehensive list of the manufacturers' representatives in attendance, and the present article will deal only generally with the exhibits and specifically with those which were not described in the previous issues.

The Albert & J. M. Anderson Manufacturing Company showed a fine line of electric-railway material, time switches and switchboards; the Appleton Electric Company, telephone supplies, wirelets and conduit fittings; the Autoelectric Sign Company, electric signs.

The exhibit of the American Steel and Wire Company showing an extensive line of bare and covered wire for electrical devices attracted a great deal of attention, and the American Electric Fuse Company made an interesting exhibition of protective devices, enameled wire, rheostats and motor-starters.

The reception quarters of the Allis-Chalmers Company, as usual, held forth many things of interest to the central-station and street-railway men, and the rep-

EXTERIOR OF COLISEUM DURING FOURTH ANNUAL ELECTRICAL SHOW, CHICAGO, JANUARY 16-30.

resentatives at this booth were kept busy explaining the features of the many lines of which this company is one of the leading manufacturers.

The electrical advertising devices shown by the American Automatic Advertising Company and also the devices shown by the Attractograph Company, came in for a good deal of notice. The ironing machinery of the American Ironing Machine Company, the curling, soldering and branding irons of the Del Sales Company, attention of the householder all through the two weeks.

In view of the wide introduction of tungsten lamps and the desirability of using these in a vertical position, where the present installation of fixtures allows only an inclined position, the adapters of the Benjamin Electric Manufacturing Company were viewed with interest, and this company also made an excellent display of wireless clusters and other electric-lighting specialties.

No more interesting or attractive display has ever been made than that of the Commonwealth Edison Company demonstrating the application of the motor drive to many industrial occupations, attracting crowds of keen observers.

The display of the Central Electric Company was exceptional in its completeness and in the attention which it attracted. The new "Opalux" fixtures and the comprehensive line of Price-McKinlock lighting specialties were a surprise to visitors, and in the adjoining booth there was made a display of "Aurola" and "Alba" flaming arc lamps. The "Alba" lamps have vertical carbons and are comparatively new in this country. They are exceptionally popular for street lighting in Europe and are rapidly gaining public favor in this country. The maximum radiation is at about thirty degrees below

GENERAL VIEW, FOURTH ANNUAL ELECTRICAL SHOW, COLISEUM, CHICAGO, JANUARY 16-30.

the vacuum cleaners of the Duntley Manufacturing Company, the fancy shades, domes and portables of the Colonial Art Glass Company, the electric incubators of the Cyphers Incubator Company, the fireless cooking stoves of the Caloric Company, the vacuum-cleaning machines of the Electric Suction Sweeper Company, the Electric Cleaner Company, the General Compressed Air and Vacuum Machinery Company, and the Milwaukee Vacuum Machinery Company held the

F. B. Badt & Company, the well-known sales agents for Weston measuring instruments and Ward Leonard rheostats, renewed many old acquaintanceships. This company's exhibit also showed the "Polar" flaming arc lamp, which will burn twenty hours on one trim of carbons, and several other electrical specialties.

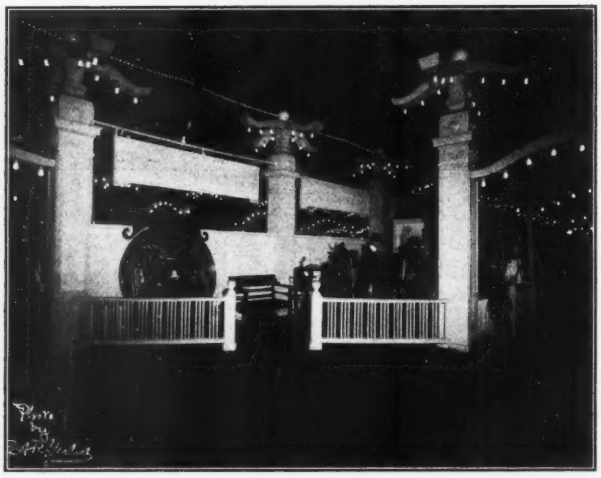
The excellent display of the Chicago Fuse Wire and Manufacturing Company gave to those interested in protective devices a good idea of the completeness of the protection which the up-to-date manufacturer has at the disposal of the enterprising public-utility corporation.

the horizontal, the spread of illumination covering a large area. The "Aurola" alternating-current and direct-current lamps take ten amperes at forty-five to forty-six volts at the arc. The "Alba" alternating-current lamp takes ten amperes, and the "Alba" direct-current lamp twelve amperes. The latter is furnished either for thirty or forty volts at the arc, two or three lamps being used in series on 110 volts.

Popular interest was demonstrated by the large crowds which always gathered about the exhibit of the Chicago Telephone Company and that of the American Telephone and Telegraph Company, and the Collins Wireless Telephone Company exhibited its wireless telephone sys-

ALLIS-CHALMERS COMPANY.

AMERICAN ELECTRIC FUSE COMPANY.



AMERICAN STEEL AND WIRE COMPANY.

APPLETON ELECTRIC COMPANY.

F. B. BADT & COMPANY.

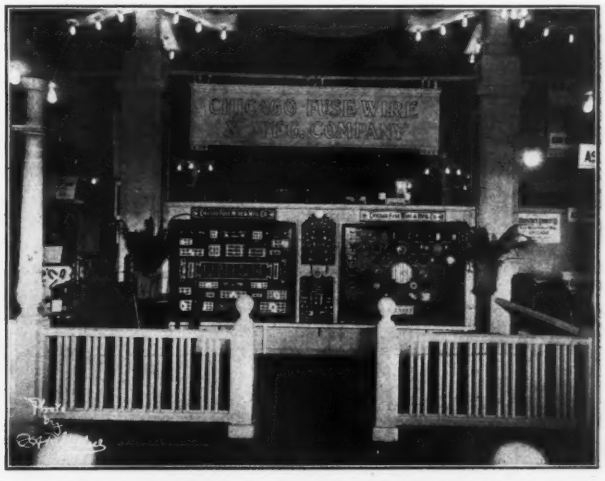
BENJAMIN ELECTRIC MANUFACTURING COMPANY.

tem, and the representatives in charge of this booth made many friends for this new aspirant for scientific honors.

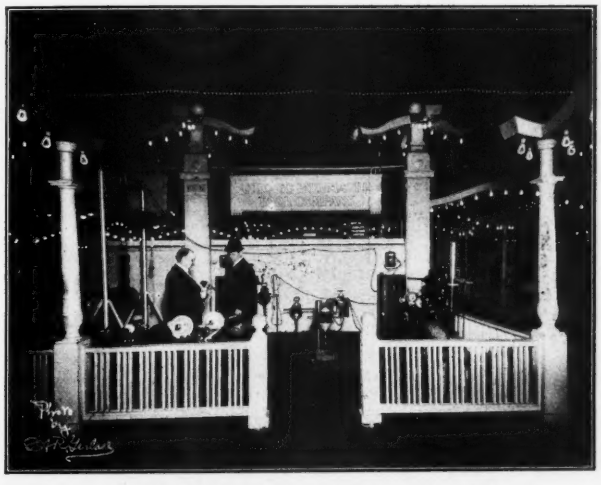
is always manifested in this excellent line. The testing apparatus shown by the Electrical Testing Laboratories continued

does not hold great attractiveness for the lay public, it can be said that without doubt a splendid object lesson was pre-

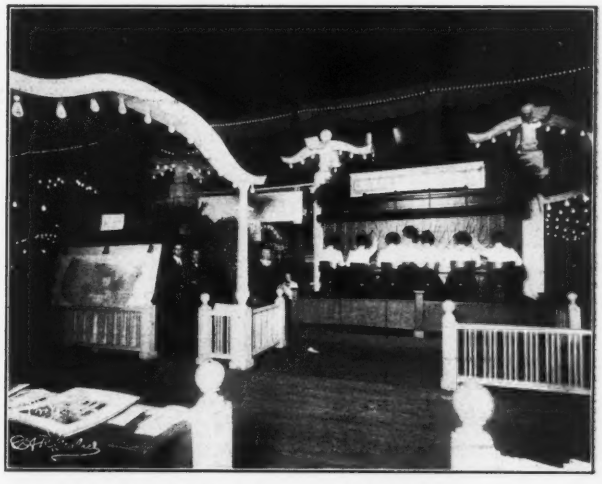
CENTRAL ELECTRIC COMPANY.



CHICAGO FUSE WIRE AND MANUFACTURING COMPANY.



CHICAGO PNEUMATIC TOOL COMPANY.



CHICAGO TELEPHONE COMPANY.

COLLINS WIRELESS TELEPHONE COMPANY.

COMMONWEALTH EDISON COMPANY.

The controlling devices of the Cutler-Hammer Manufacturing Company were well shown, and a great deal of interest

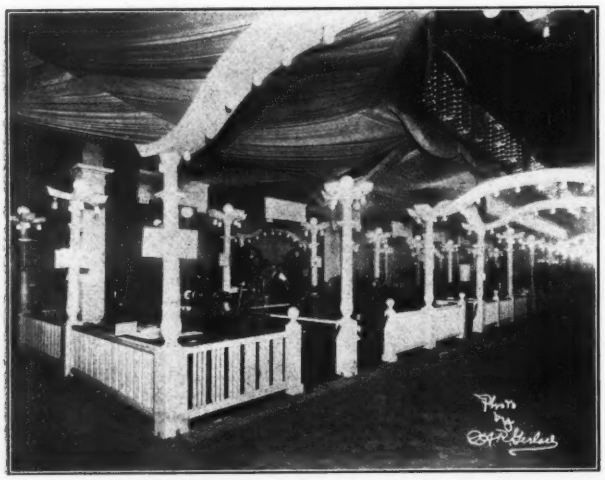
to attract large numbers of interested people, and while it might be assumed that purely scientific apparatus of this nature

sented to those interested in electrical devices of the efficiency and value of the apparatus exhibited at this booth. Across

the aisle the Electric Storage Battery Company made a very interesting exhibit of cells for various purposes.

Company, showing a very interesting line of Excello flaming arc lamps; the Fort Wayne Electric Works, arc lamps, trans-

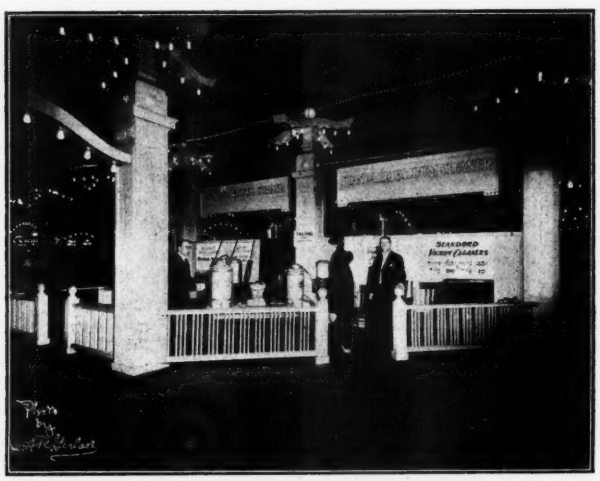
Company, pneumatic clocks, programme clocks and electric clocks; Hinde & Dauch Paper Company, corrugated paper special-



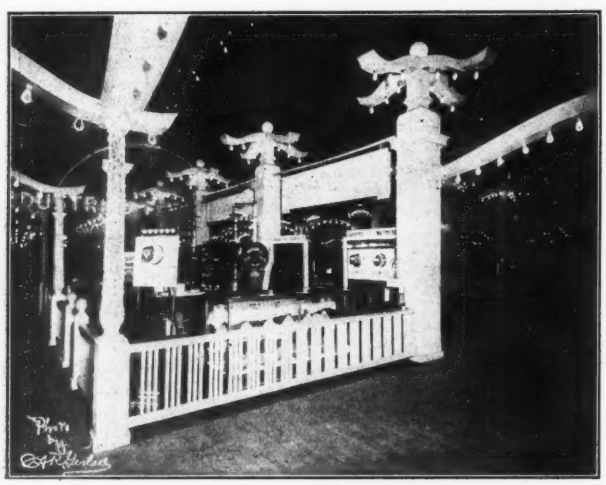
COMMONWEALTH EDISON COMPANY.

CRESCENT COMPANY.

CUTLER-HAMMER MANUFACTURING COMPANY.



DUNTLEY MANUFACTURING COMPANY.



ELECTRIC APPLIANCE COMPANY.

ELECTRIC STORAGE BATTERY COMPANY.

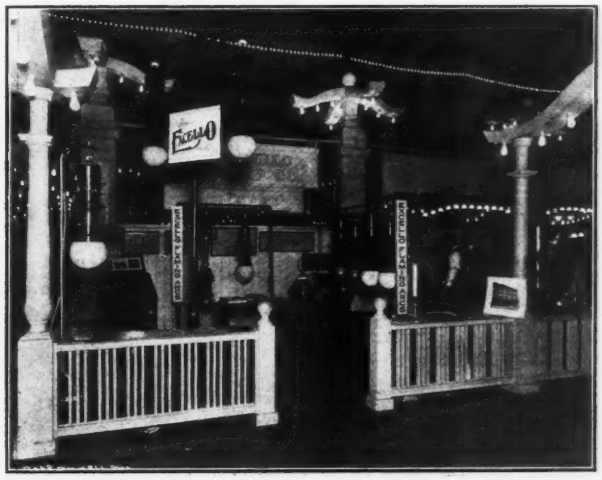
Other attractive exhibits were those of the Electric Appliance Company, general electrical supplies; the Excello Arc Lamp

formers and motors; Federal Electric Company, electric signs, fixtures, sockets and specialties; Hahl Automatic Clock

ties and cartons for shipping electrical supplies; Kellogg Switchboard and Supply Company, telephone switchboards and

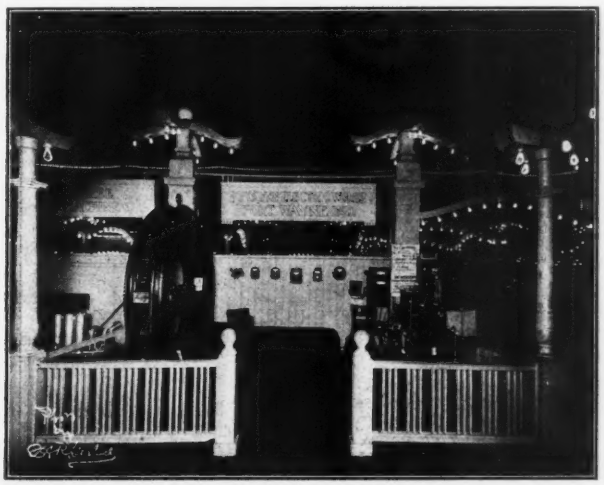
switchboard supplies; Mathias Klein & Sons, electrical tools; Indicator Electric Company, time stamps, electric clocks and "Linolite" system of lighting; Lindstrom, Smith Company, vibrators and electrical specialties; Murphy Electricity Rectifier Clay Works, telephone, telegraph and electric-lighting underground conduits; G. M. Gest, electrical engineer and contractor

ELECTRICAL TESTING LABORATORIES.



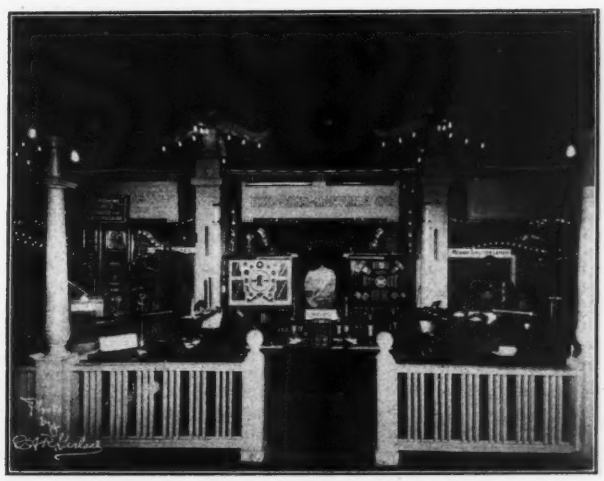
EXCELLO ARC LAMP COMPANY.

FEDERAL ELECTRIC COMPANY.



FORT WAYNE ELECTRIC WORKS.

GENERAL ELECTRIC COMPANY.



H. W. JOHNS-MANVILLE COMPANY.

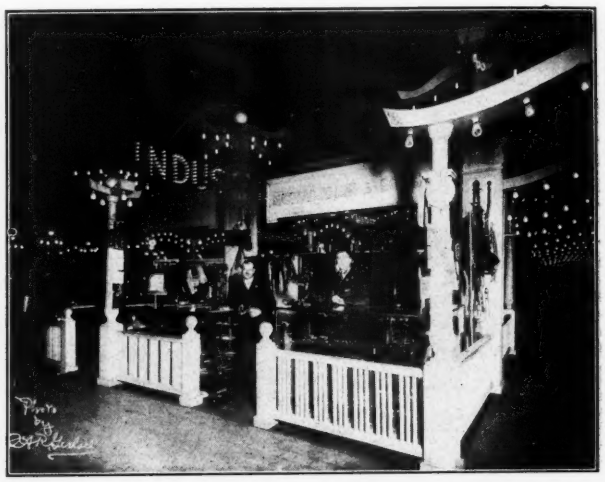
flashers; H. W. Johns-Manville Company, electrical specialties and supplies, and an excellent demonstration of the Company, the Murphy rectifier; Manhattan Electrical Supply Company, batteries and other electrical specialties; McRoy for underground systems; Mechanical Appliance Company, motors, generators, projectors and moving-picture appliances,

and a demonstration of the Alsop Process Company's electrical flour sterilizing and aging process.

Phone Company an antiseptic telephone receiver appliance and acoustic devices; the Monarch Vibrator Company, electrical

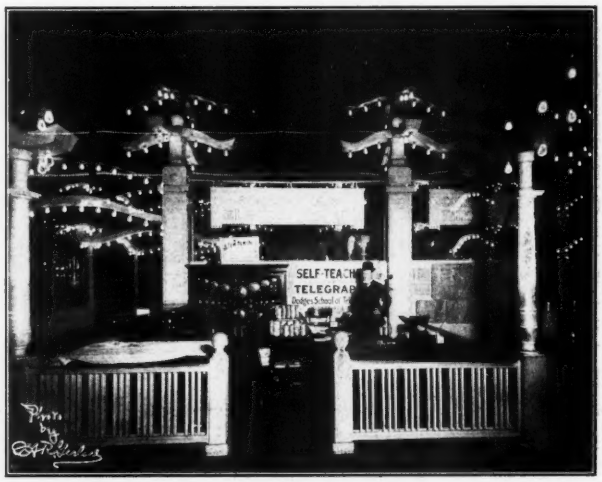
tiple-spindle screw machines; the Northern Electrical Manufacturing Company, electric rock drills and motors; C. S.

KELLOGG SWITCHBOARD AND SUPPLY COMPANY.

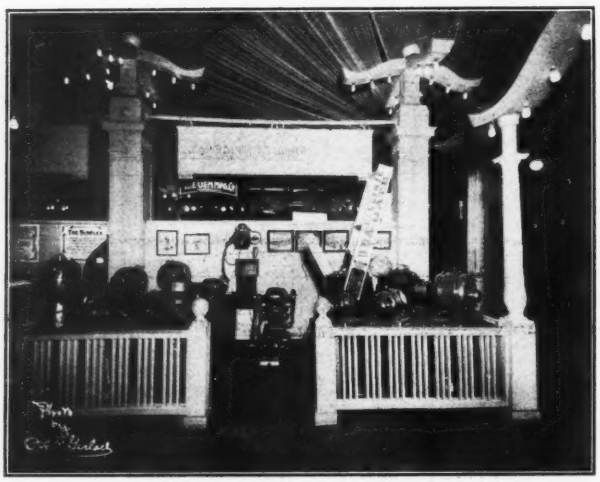


MATHIAS KLEIN & SONS.

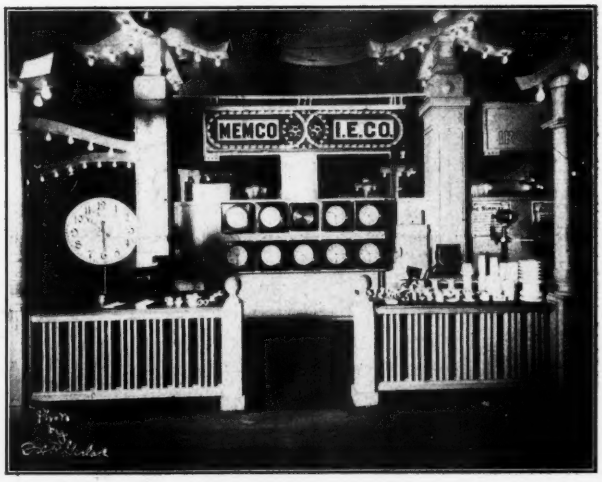
McROY CLAY WORKS.



MANHATTAN ELECTRICAL SUPPLY COMPANY.



MECHANICAL APPLIANCE COMPANY.



MECHANICAL AND ELECTRICAL MANUFACTURING COMPANY.

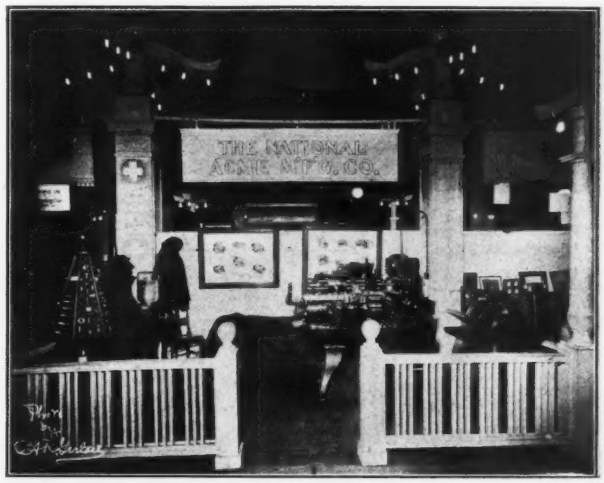
The Mechanical and Electrical Manufacturing Company showed a line of porcelain electrical specialties; the Mears Ear

appliances; the National Battery Company, storage batteries; the National Acme Manufacturing Company, automatic mul-

Nevill & Company, electric signs; National Carbon Company, batteries and carbon products; Oral and Motion Advertis-

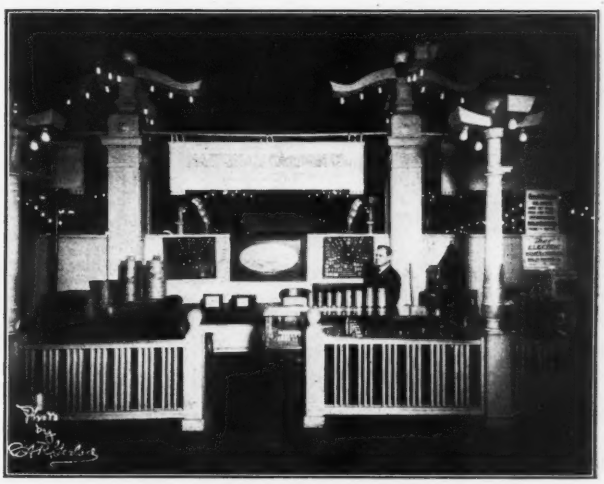
ing Company, electrically operated advertising devices; Henry Newgard & Company, who wired the Coliseum for the receptacle; the Peerless Light Company, art-glass domes and portables; Taussig & Babcock, motors, generators, circuit-breaktor-driven water systems; Red Cross Antiseptic Company, antiseptic telephone mouthpieces; Roth Bros., motors, gener-

MURPHY ELECTRICITY RECTIFIER COMPANY.

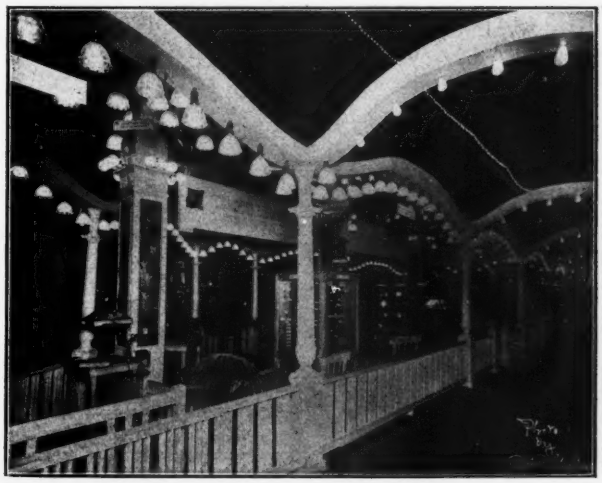


NATIONAL ACME MANUFACTURING COMPANY.

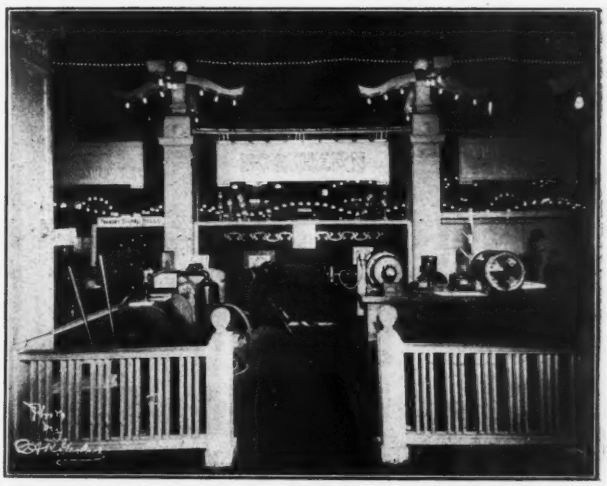
NATIONAL BATTERY COMPANY.



NATIONAL CARRON COMPANY.



ENGINEERING DEPARTMENT, NATIONAL ELECTRIC LAMP ASSN.



NORTHERN ELECTRICAL MANUFACTURING COMPANY.

lighting features, a line of Newgard specialties, including an exceptionally interesting water-tight and weather-proof lamp ers, measuring instruments, remote-control switches and turbines; United Pump and Power Company, pneumatic and mo- ators, grinders, etc.; Shelton Electric Company, vibratory apparatus; Stoltz Electrophone Company, "Electrophones;"

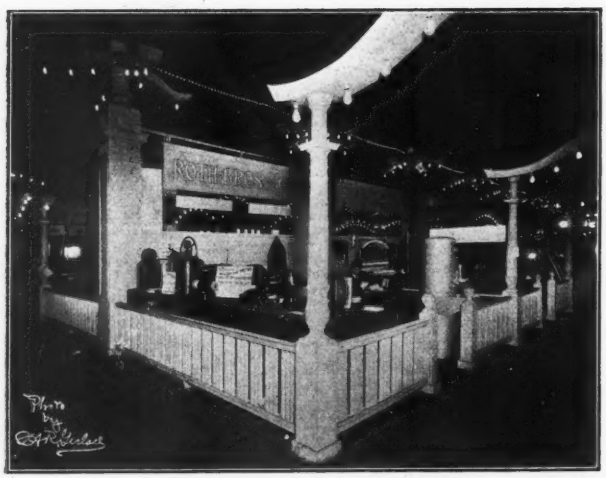
Stromberg-Carlson Telephone Manufacturing Company, telephone apparatus; Swedish-American Telephone Company, telephones; Swedish Electric Vibrator Company, vibrators; Wagner Electric Manufacturing Company, electrical accessories, transformers, motors and instruments; Western Insulation Company, insulation specialties; Western Electric Company, telephone train-dispatching systems and switchboards; Weinsheimer Company, "Stavelco" arc lamps, circuit breakers and measuring instruments; Grant Flaming Lamp Company, the Grant flaming arc lamp, manufactured by the German-American Electric Company.

PACIFIC ELECTRIC HEATING COMPANY.

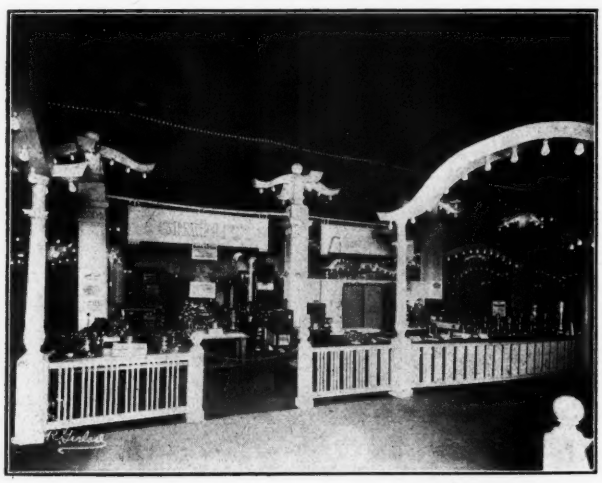
PERFECTION VACUUM CLEANER COMPANY.

PHŒNIX GLASS COMPANY.

ROBBINS & MYERS COMPANY.



ROTH BROTHERS & COMPANY.

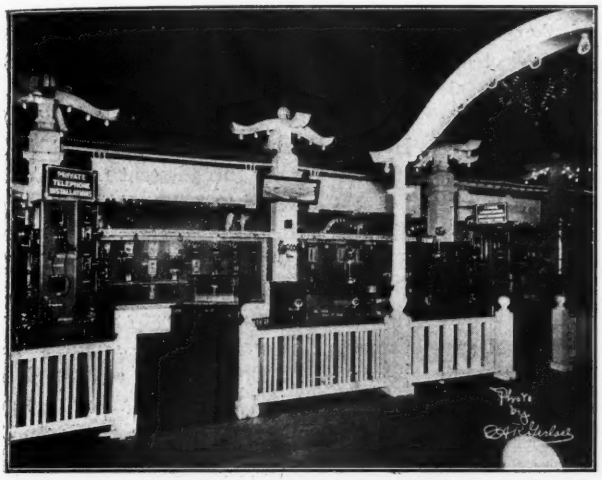


SIMPLEX ELECTRIC HEATING COMPANY.

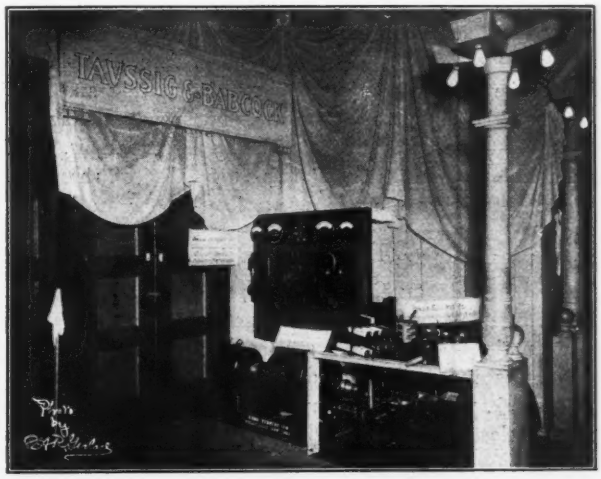
The electrical heating and cooking de-

vices shown by the General Electric Company attracted large crowds, and the representatives and demonstrators were kept busy explaining and exhibiting the fine points of these devices.

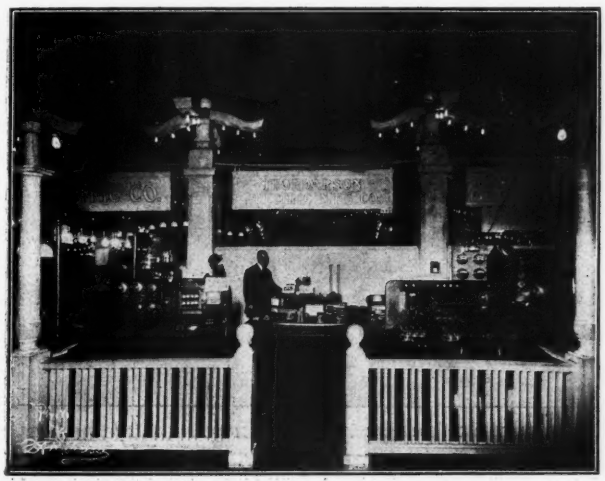
The booth of the National Electric Lamp Association was the centre of interest for both the electrical and lay public. Particular attention was attracted by the demonstration of the color values of the tungsten lamp in comparison with the older forms of incandescents. The advantages of the new high-efficiency illuminants to both the consumer and the supplier were demonstrated in many ways, and the various reflectors shown by the Holophane Company in conjunction with this exhibit were of great interest. The



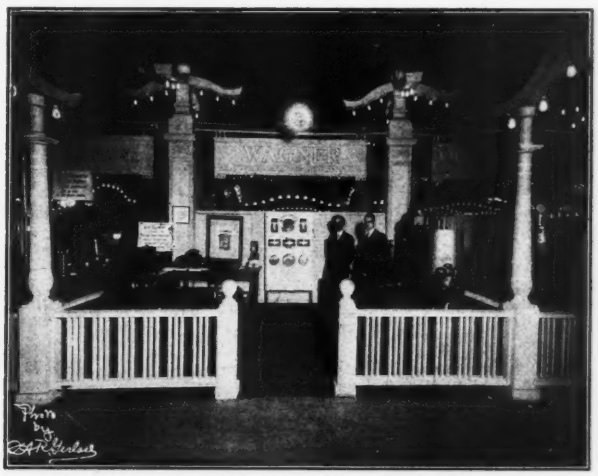
STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY.



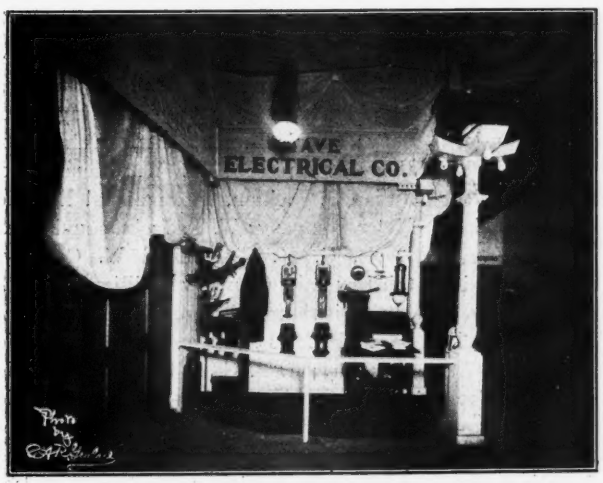
TAUSSIG & BABCOCK.



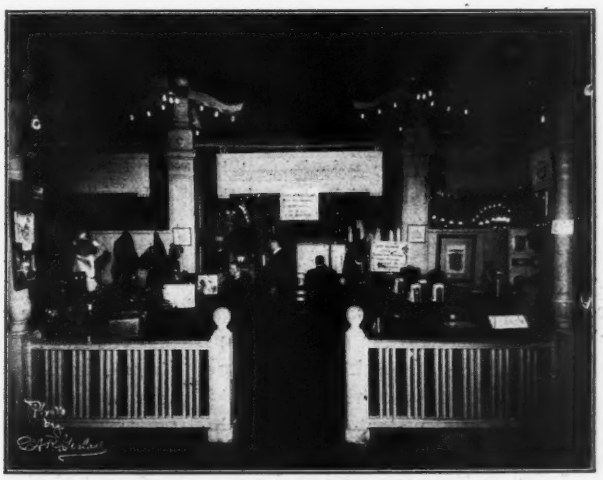
THORDARSON ELECTRIC MANUFACTURING COMPANY.



WAGNER ELECTRIC MANUFACTURING COMPANY.



WEINSHEIMER COMPANY.



WESTERN ELECTRIC COMPANY.

Pacific Electric Heating Company, in addition to a very complete exhibit of its "Hot Point" flatirons, showed an iron three feet tall, and built proportionally.

Another interesting exhibit of flatirons was made by the Pelouze Electric Heater Company.

One of the most interesting displays of art-glass shades and fixtures was that of the Phœnix Glass Company, this line being particularly complete, and affording a selection covering the widest possible range.

The scientific exhibit of the Thordarson Electric Manufacturing Company was particularly complete, and attracted a great deal of notice. One of the spectacular features was the production of a high-tension spark, which traveled up two conductors enclosed in a glass cylinder, the arc breaking as the ends of the wires were reached. Another feature was a Geissler tube, the terminals of which were attached to the secondary of a small induction coil. By tuning the vibrator to the natural period of the frequency of the current, a unidirectional current was caused to pass, affording a pretty demonstration of the rectifier or electric valve principle. The No. 2 toy transformer, which stepped the voltage down to a series of combinations from three volts to twenty-six volts, allowing an interesting demonstration of electric toys to be made, appealed to the public. The new ignition sets for jump-spark and make-and-break engines were something decidedly novel.

The "Standard" motor, driving a submerged bilge pump, exhibited by the Robbins & Myers Company, attracted much favorable comment, and the fine line of sewing-machine motors, ceiling, desk and bracket fans, also came in for a good share of attention.

The booth of the Westinghouse Electric and Manufacturing Company was one of the busiest places in the Coliseum, particular attention being paid to the new Type S distributing transformers. There was also a fine exhibit of telephone-booth fans, eight-inch bedroom fans, electrical heating and cooking devices, and small power motors for industrial and domestic occupations, together with motor-starting devices, rheostats, battery-charging outfits, flame arc lamps, incandescent lamps and carbon arc lamps.

The Mechanical and Electrical Manufacturing Company exhibited a line of porcelain sockets, bushings and outlet-box covers, with many combinations and special features having a view to strength and economy.

The exhibit of the Simplex Electric Heating Company, showing a complete line of electric heating appliances, included a number on show for the first time. These were a circulation water heater which may be attached to any kitchen or range tank, a special glue pot for cabinetmakers' use, and special designs of food warmers for hotels, butler's pantry, etc. A complete line of chafing dishes, percolators, tea-kettles and various sizes of ranges and cooking combinations were also shown.

Among those long familiar with the industry who were seen during the show were the following: C. F. McGilvray and H. B. Ramey, Robbins & Myers Company; Arthur Williams, New York Edison Company; E. Irving, Sunbeam Incandescent Lamp Company; J. J. Nate, Stromberg-Carlson Telephone Manufacturing Company; F. H. Gale, F. W. Willcox and E. L. Callahan, General Electric Company; H. B. Vanzwoll, Sunbeam Incandescent Lamp Company; E. H. Haughton, F. S. Corby and Sam Furst, Bryan-Marsh Company; James Wolff, New York Insulated Wire Company; H. H. Cudmore, Brilliant Electric Company; W. S. Heger and C. A. Tupper, Allis-Chalmers Company; M. Lobenthal, Economical Electric Lamp Company; W. S. Howell, Electrical Testing Laboratories; V. R. Lansingh, C. R. Howe and W. D. Howe, Holophane Company; R. K. Mickey, Novelty Incandescent Lamp Company; C. N. Thorpe, Franklin Electric Manufacturing Company; F. W. Hulme, Grant Flaming Lamp Company; H. M. Hirschberg and G. W. Armstrong, Excello Arc Lamp Company; J. Robert Crouse, National Electric Lamp Company; S. E. Doane, chief engineer, National Electric Lamp Association; George Loring, Shelby Electric Company; A. C. Garrison, Columbia Incandescent Lamp Company; Alex Henderson, National Metal Molding Company; William Coale and W. R. Bonham, Sterling Electrical Manufacturing Company; H. C. Rice, General Incandescent Lamp Company; J. W. Phelps, Phelps Manufacturing Company; Claude L. Matthews, W. N. Matthews & Brother; W. W. Cheney and Julian S. Jackson, International Electric Meter Company; W. T. Jackson and J. A. Doyle, G. M. Gest; Fred W. Godfrey, Godfrey Sales Company; William A. Donkin, Pittsburg Reinforcing Pole Company; F. M. R. Evans, Buckeye Electric Company; C. P. Cook, Campbell Electric Company; Hugh L. Adams, Electric Service Supplies Company; W. A. Campbell, Hicks Locomotive and Car Works; A. N. Fox, Benjamin Electric Manufacturing Company; F. G. Jones and G. W. Rodormer, American Electric Fuse Company; F. B. Badt, F. B. Badt & Company; G. A. McKinlock, Charles E. Brown, H.

WESTERN INSULATION COMPANY.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.

W. Young and H. Caird, Central Electric Company; A. S. Merrill and W. W. Merrill, Chicago Fuse Wire and Manufacturing Company; C. B. Coates, Chicago Pneumatic Tool Company; J. H. McGill and F. R. Bryant, Crescent Company; Charles J. Klein, Cutler-Hammer Manufacturing Company; L. J. Auerbacher, New York Flaming Arc Lamp Company; P. R. Boole, Electric Appliance Company; W. S. Goll and W. S. Hine, Fort Wayne Electric Works; Godfrey H. Atkin, Electric Storage Battery Company; Philip R. Fisher, Condit Electrical Manufacturing Company; H. M. Frantz, T. G. Younglove and J. W. Perry, H. W. Johns-Manville Company; C. C. Baird, McRoy Clay Works; F. H. Ford, J. G. Zimmerman, Mechanical Appliance Company; E. B. Cottrill and Bertram Smith, National Battery Company; H. F. Holland, Pacific Electric Heating Company; H. C. Slemin, Stromberg-Carlson Telephone Manufacturing Company; E. B. Overshiner and A. V. Overshiner, Swedish-American Telephone Company; W. A. Layman, W. Robbins and F. N. Jewett, Wagner Electric Manufacturing Company; T. P. Gaylord and J. C. McQuiston, Westinghouse Electric and Manufacturing Company; Edward H. Fox, Phœnix Glass Company; Arthur W. Berresford, Cutler-Hammer Manufacturing Company; D. J. Burns, Ward Leonard Electric Company; H. M. Post, Western Electric Company; George Cutter, George Cutter Company; I. J. Murphy, Murphy Electricity Rectifier Company; A. D. Lundy, Sargent & Lundy; C. E. Owens, Rome Brass and Copper Company; E. H. Heilstedt, Chicago Mica Company; Albert Scheible, Ajax Line Material Company; Wm. B. Jackson, D. C. and W. B. Jackson; J. R. Wiley, Standard Underground Cable Company; B. S. Barnard, Standard Vitrified Conduit Company; A. Kling, Detroit Fuse and Manufacturing Company; F. T. Benson, General Electric Company.

Among the out-of-town visitors were the following:

Alabama—A. H. Walstrom, George D. Whitcomb Company, Birmingham.

California—A. B. Saunders, Los Angeles.

Colorado—Joseph J. Henry, Southern Colorado Power and Railway Company, Northern Colorado Power Company, Consolidated Power and Light Company of South Dakota, Denver. W. J. Farr, manager, Eaton Electric Company, Eaton.

Illinois—L. A. Tripp, assistant secretary, Consolidated Electric and Manufacturing Company, Assumption. Roscoe S. Davidson, chief electrician, Consolidated Electric and Manufacturing Company, Assumption. M. F. Pierce, general foreman, Electrical Department, Western United Gas and Electric Company, 36 Fox Street, Aurora. T. C. McKeen, cashier, Public Service Operating Company, 118 East Pleasant Street, Belvidere. H. T. Wilson, chief electrician, Public Service Operating Company, 114 East Fourth Street, Belvidere. H. Serkowich, wire chief, Chicago & Alton Railway Company, Bloomington. Fred I. Hange, Miller & Hange, Berwyn. F. E. Aldrich, inspector, Bell Telephone Company, 1212 North Madison Street, Bloomington. A. L. Perry, city electrician, Batavia. H. E. Willson, Illinois Central Railroad, Carbondale. J. M. Bateman, Champaign. W. H. Dickinson, president, Tri-County Mutual, Creston. A. G. Betts, superintendent Coal City Electric Plant, Coal City. E. W. Hendershot, comptroller, Illinois Traction Company, Champaign. E. C. Jenks, manager, Charleston Illuminating Company, Charleston. Charles Leslie Puffer, Electric Appliance Company, Downers Grove. George E. Murray, electrician, Wabash Railroad, Decatur. Harry Kelley, manager, Inter-State Telephone Company, Dunda. W. H. Burke, purchasing agent, Illinois Traction System, Decatur. George Fisher, superintendent light and heat, Danville Street Railway and Light Company, Danville. C. B. Yonts, Danville Street Railway and Light Company, Danville. V. B. Barber, cable inspector, C. W. Telephone Company, Decatur. George Willius, electrician, Danville. Fred Gussman, Aurora, Elgin & Chicago Railway, Elgin. William T. Mullen, engineer, Aurora, Elgin & Chicago Railway, Elgin. W. Bosworth, Elgin. Calvin P. Austin, Effingham Electric Light and Power Company, Effingham. D. S. Hubbell, Elgin. Dan S. Miller, manager, Gridley Electric Light Company, Gridley. C. Gustason, electrician, Gridley Electric Light Company, Gridley. J. T. Callaway, president, Greenfield Light and Power Company, Greenfield. L. E. Gorham, Geneseo Electric Light Company, Geneseo. C. R. Shiffind, secretary, Greenfield Light and Power Company, Greenfield. R. C. Allen, Gilman Electric Light and Power Company, Gilman. J. G. Whitright, Genoa. J. H. Criekenberger, Hernz Electric Light and Power Company, Hernz. E. S. Sterrett, manager, Henry Telephone Company, Henry. Harry Retel, Natoma Farm, Hinsdale. E. R. Frost, Holkenbrink & Frost, Jacksonville. G. A. Sieber, Jacksonville. Howard N. Flexer, Joliet. John P. Hansen, Joliet. R. J. Kess, Kankakee. Robert H. Whipple, Kewanee Light and Power Company, Kewanee. Cyril J. King, Lewistown Electric Plant, Lewistown. J. C. Lamkin, superintendent, The Marseilles Telephone Company, Marseilles. H. W. Cark, president and general manager, Mattoon Clear Water Company, Mattoon. W. C. Lumpkin, general manager, Coles County Telephone and Telegraph Company, Mattoon. A. L. Held, Maywood. W. J. Richert, wireman, Momence Electric Light Company, Momence. Jesse McCline, Monticello Electric Light Company, Monticello. J. A. Bortz, manager, Nauvoo Electric Light and Power Company, Nauvoo. M. W. Tedrow, New Salem. W. H. Casselberry, president, Nokomis Electric Light and Power Company, Nokomis. G. H. Jones, secretary Oregon Electric Light and Power Company, Oregon. H. E. Harnish, electrician, Oregon Electric Light and Power Company, Oregon. W. G. Miller, mechanical and electrical engineer, Chicago, Ottawa & Peoria Railway, Ottawa. John Frederick, Paxton. C. W. Denman, interior wireman, Paxton Electric Company, Paxton. J. W. M. Burton, president Paxton Electric Company, Paxton.

Indiana—W. S. Poling, Indiana Galvanizing and Manufacturing Company, Anderson. E. H. Hixon, secretary, Crown Point Electric Company, Crown Point. J. C. Howland, Crown Point Electric Company, Crown Point. E. L. Harman, secretary and general manager, Disko & Laketon Telephone Company, Disko. W. R. Diamond, East Chicago. R. E. Babcock, Indiana & Michigan Electric Company, Elkhart. J. E. Enders, signalman, L. S. & M. S. Railway Company, Elkhart. C. E. Ingerson, foreman, Elkhart. J. P. Ohmer, superintendent, Indiana & Michigan Electric Company, Elkhart. C. R. Rowley, maintainer, L. S. & M. S. Railway, Elkhart. J. J. Brennan, Ft. Wayne & Wabash Valley Traction Company. E. D. Eames, general manager, Ft. Wayne & Wabash Valley Traction Company. Raymond Harper, chief electrician, Wayne Knitting Mills, Ft. Wayne. G. L. Fosland, Indiana Harbor. A. L. Strauss, secretary, Strauss & Company, Indianapolis. C. S. Walker, secretary and treasurer, The Varney Electrical Supply Company, Indianapolis. Hugh H. Dungan, Kokomo. George Engstrom, La Porte Electric Company, La Porte. Samuel Perrott, president and manager, City Lighting Company, Linton. Martin White, chief engineer, City Lighting Company, Linton. Charles M. Price, wire chief, Home Telephone Company, Logansport. C. C. Clark, manager, Lynn Local Telephone Company, Lynn. E. T. Hollingsworth, Marion Light and Heating Company, Marion. H. Applegate, Northern Indiana Railway Company, Michigan City. W. F. Warner, Warner Arc Lamp Company, Muncie. Charles G. Burton, Peru Electric Manufacturing Company, Peru. George Emenaker, assistant manager, Plymouth Electric Light Plant, Plymouth.

Iowa—W. L. Rhoads, wire chief and electrician, C., B. & Q. Railway, Burlington. Monroe Johnson, manager, Emmetsburg Telephone Company, Emmetsburg. Frank Klinesmith, Clinton Gas and Light Company, Clinton. A. F. Hopkins, Clinton Gas, Light and Coke Company, Clinton. M. Fred Clark, line foreman, Clinton Gas, Light and Coke Company, Clinton. H. Schmidt, H. Schmidt Electric Company, Davenport. A. T. Pentzell, electrician, Independent Baking Company, Davenport. George G. Kuhn, People's Light Company, Davenport. George B. Fox, Decorah. R. R. Grant, Des Moines. Paul Dvorsky, Iowa City. H. Bellainy, Knoxville Electric Company, Knoxville. Otto E. Brownell, Lake City. T. Johnson, Latinie. M. J. Boughton, Buchanan-Boughton Company, Marshalltown. W. J. Wilson, secretary and treasurer, Miles Telephone Company, Miles. E. M. Chesebro, Shellrock. R. J. Mullins, superintendent, W. C. E. L. & W. W., Webster City.

Kansas—C. Ernstein, Ernstein & Jones, Independence. Charles M. Hagler, Salina. E. B. J. Carlos, manager, Walnut Telephone Company, Walnut. L. H. Kaufman, Edison Light and Power Company, Wichita.

Kentucky—Lewis S. Streng, chief engineer, Kentucky Electric Company, Louisville. Charles F. Gall, fire department, Louisville.

Michigan—A. D. Mosher, Swarze Electric Company, Adrian. E. D. Hubbard, general foreman telegraph, Grand Trunk Railway, Battle Creek. G. A. Ream, shop electrician, Grand Trunk Railway, Battle Creek. F. E. Smallidge, manager, Electrical Construction Company, Benton Harbor. John A. Cavanaugh, superintendent, Benton Harbor, St. Joe Railway and Light Company, Benton Harbor. N. V. Gerrish, secretary, Cadillac Water and Light Company, Cadillac. I. B. Galbreath, superintendent, Electric Light and Water Works, Decatur. Milton E. Reading, electrician, Michigan Central Railroad Company, Detroit. F. Thomas Turner, Muskegon Power Company, Grand Rapids. H. Al. Chase, manager, Hart Municipal Electric Light and Water Works, Hart. George W. Goss, M. D., Genesee Electric Manufacturing Company, Flint. Loyd Dietz, Mancelona. W. L. Eyke, engineer, Muskegon Traction and Lighting Company, Muskegon. H. S. Nelson, purchasing agent, Muskegon Traction and Lighting Company, Muskegon.

Minnesota—George J. Cass, Caledonia. W. O. Harting Electric Company, Minneapolis. John M. Zeessman, Minneapolis Electric Motor Company, Minneapolis. C. A. Yergin, manager, Public Service Operating Company, Owatonna.

Missouri—E. H. Burlingham, superintendent, People's Gas and Electric Company, Chillicothe. C. Pelley, Consumers' Electric Light and Power Company, De Soto. F. S. Cunningham, secretary and treasurer, Norborne Fuel, Ice and Light Company, Norborne. H. W. Briscoe, salesman, Wagner Company, St. Louis.

Montana—W. W. Tracy, Butte.

Nebraska—J. L. Baker, president, Larsen-Baker Ice Machinery Company, Omaha. A. J. Collett, electrical engineer, Union Pacific Railroad, Omaha. Wilber L. Burgess, Burgess-Granden Company, Omaha. M. J. Curran, superintendent construction, Burgess-Granden Company, Omaha.

New Jersey—William Dubilier, chief electrician, Collins Wireless Telephone Company, Newark. A. F. Collins, technical director, Collins Wireless Telephone Company, Newark.

New Mexico—E. J. Huber, wire chief, Roosevelt County Telephone Company, Texico.

Ohio—R. L. Johnston, superintendent lighting department, the N. O. T. & L. Company, Akron. B. B. Baughman, superintendent of telegraph, the Wheeling & Lake Erie Railroad Company, the Wabash-Pittsburg Terminal Railway Company, West Side Belt Railroad Company, Canton. F. A. Murre, Murre International Company, Cincinnati. J. E. Peavry, superintendent, Cincinnati & Suburban Bell Telephone Company, Cincinnati. R. T. McCommas, assistant general manager, Cincinnati & Suburban Bell Telephone Company, Cincinnati. S. N. Wight, signal inspector, L. S. & M. S. Railway, Cleveland. C. R. Stevenson, chief electrician, the Fremont Yaryan Company, Fremont. A. T. Schumann, Gresham. L. C. Milner, electrician, Leesburg. A. J. Darrah, superintendent, the Van Wert Public Service Company, Van Wert.

Oklahoma—Charles E. Vegiard, Oklahoma City.

Ontario, Can.—W. R. Pearce, Wallacetown.

South Dakota—C. M. Barnes, C. M. Barnes & Company, Aberdeen.

Tennessee—R. L. Biles, W. S. Biles & Company, Memphis.

Washington—C. B. Moss, deputy county engineer, Spokane.

West Virginia—W. H. Young, Dorr.

Wyoming—H. P. Rothwell, Buffalo Manufacturing Company, Buffalo.

Wisconsin—George M. Pierce, manager and owner, Brodhead Electric Company, Brodhead. William Pitman, electrician, Phonex Manufacturing Company, Eau Claire. R. E. Seeley, Eastern Wisconsin Railway and Light Company, Fond du Lac. J. B. Kolsta, representative, Eastern Wisconsin Railway and Light Company, Fond du Lac. F. A. Albrecht, electrician, Janesville Electric Company, Janesville. M. G. Jeffris, president, Janesville Electric Company, Janesville. D. J. Marcus, solicitor, Janesville Electric Company, Janesville. Earle S. Metcalf, Janesville Electric Company, Janesville. D. G. Galley, electrician, Chicago Brass Company, Kenosha, Wis. C. Robert Lindahl, electrician, Chicago Brass Company, Kenosha. George Hibbard, Lake Geneva. F. S. Hartman, sales manager, Northern Electrical Manufacturing Company, Madison. W. F. Lent, Madison. C. W. Rust, Northern Electrical Manufacturing Company, Madison. Edward A. Golden, electrician, M. & M. Light and Traction Company, Marinette. J. A. Cook, Milwaukee Electrical Construction Company, Milwaukee. Henry Czech, Ed. Schuster Company, Milwaukee. W. J. Fey, superintendent, C., M. & St. P. Railway, Milwaukee. H. S. Hibbard, electrical engineer, Cutler-Hammer Manufacturing Company, Milwaukee. C. Parske, electrician, Milwaukee Electrical Construction Company, Milwaukee. Otto Schedler, electrical contractor, Milwaukee. Henry Schultz, chief engineer, Ed. Schuster Company, Milwaukee. J. G. Zimmerman, Mechanical Appliance Company, Milwaukee. R. J. Penhallegon, Jr., secretary, Mineral Point Telephone Company, Mineral Point. H. C. Sterling, superintendent, Electric Light and Water Works, New London.

Northwestern Electrical Association.

A Rousing Convention at Milwaukee, Wis., January 20-21.

The seventeenth annual convention of the Northwestern Electrical Association, held at the Hotel Pfister, Milwaukee, Wis., on January 20 and 21, was one of the most successful ever conducted by the association. The convention drew considerably over 150 men to Milwaukee and the interest evoked at the various sessions showed that the association had not only overcome the apathy manifested in its affairs during the past few years, but had entered on a new era of far-reaching influence to the electric-lighting interests of Wisconsin and its neighboring states.

THE WEDNESDAY MEETINGS.

The first session was opened on Wednesday, at 10:40 a. m., with President P. H. Korst in the chair. It was devoted to general business. Reading of the minutes of the last convention was dispensed with and the president immediately read his annual address, from which the following extracts are taken:

PRESIDENT'S ADDRESS.

"The Northwestern Electrical Association was organized in February, 1893, with Carroll Collins, of Green Bay, Wis., as president. At that meeting there were present six or seven central-station representatives and one lone supply man. The interest in the organization was intense from the start, and the second annual meeting was largely attended, with a good programme and live discussions.

"The membership was soon almost as large as that of the National Association, and was of far more interest and benefit to the smaller central-station men. This association has, in the past, been honored by having some of the foremost men in the electrical industry present papers of widespread interest, and in the days before the numerous state and sectional associations, its proceedings were beneficial to the industry throughout the entire country.

"Today we have an exceedingly bright outlook for the business of generating, distributing and selling electricity, and each month the field grows larger. The advent of the tungsten lamp has placed electric lighting on a much lower cost basis to the users, so that they no longer need pay a premium for the advantages of using our product. It has opened many new fields that were formerly barred to us on account of cost, and should prove the means of largely increasing our business.

"Power work is growing in importance to us, and we should so aim to take on the business that a good average load-factor will result. Our section of the country has many industries that can regulate their working hours so that no power and not much light will be used during the peak-load hours of the winter months, provided sufficient inducement can be offered to make it an object for them to do so. A few of such industries are as follows: Creameries, canning factories, cold-storage warehouses, and refrigerating machines, some of the woodworking industries, city water and other forms of pumping.

"Electric laundry irons, toasters, chafing-dishes, and coffee percolators are very helpful in adding another tie between customer and company. We can expect soon a fireless cooker with an electric heating element in it that will be so economical in the use of current that the expense will be moderate even at the lighting rate. This cooker will boil, bake, broil, roast, and, in fact, do almost any necessary manner of cooking with the ordinary cooking utensils. It is needless to add how much this will boost the use of electricity.

"The need of a business-getting department has been thoroughly preached the past few years, with much benefit to those who saw the former short-sightedness and now we only wish to be shown new methods of procuring desirable business, to interchange ideas on this subject, and accept some of the suggestions of our friends, the supply men.

"The work of the Railroad Commission of Wisconsin is of great interest to us, and will receive much attention at this meeting. We should feel proud of the personnel of the commission, and its employes, and render them as much assistance as possible in carrying on their work. Any company desiring to do right by its customers need fear no injury from the commission, but will be benefited, since it will show the consumer that we are rendering good service at reasonable rates, and have accurate meters, or oblige us to improve on any such part of our services or practices as may be deficient.

"The smaller companies will be inclined to object to the refinement of accounting which will be required by the commission to afford them the neecssary information to act intelligently when complaints are filed, but the benefit to the company of this additional information will more than offset the extra cost and trouble. The information will also enable citizens of those places with utilities owned by the municipality to judge whether this is a benefit or otherwise by comparison with reports of privately owned utilities.

"Uniform accounts will also enable our members to compare costs of operation and receipts per head of population and thereby find out how much they have to gain by getting more business or lowering their cost of operation."

GENERAL BUSINESS.

A number of committees were then appointed. The nominating committee consisted of W. R. Putnam, chairman, B. D. Viles and Mr. Lands. The committee on legislation consists of Irving P. Lord, of Waupaca, and B. L. Parker, of Green Bay, Wis.

At the last convention there had been appointed a committee consisting of J. S. Allen, of Lake Geneva, and W. B. Voth, of Sheboygan, Wis., to confer with a committee from the Wisconsin Electric and Interurban Railway Association relative to merging the two associations. For this committee Mr. Allen reported that it would be better not to merge the two organizations, since each occupied a distinct field, that of electric lighting and power on the one side and electric railways on the other. The agitation of this matter last year was due to the low ebb of interest in the work of the Northwestern Electrical Association. However, this crisis has passed and the association is in better condition than for many years.

Ernest Gonzenbach, of Sheboygan, Wis., said the committee had not understood the aim of the proposed merger. The loss of identity of each association was not contemplated; more active co-operation between them was desired. The railway association had borne the brunt of the work of laying before the Legislature the attitude of the public-service corporations toward the utilities legislation that had been recently enacted; therefore it was but just that the Northwestern Association should assume its share.

President Korst suggested that by his

appointment of the same gentlemen as the committee on legislation as constituted this committee for the Wisconsin Electric and Interurban Railway Association, co-operation on this subject between the two associations was assured.

Secretary R. N. Kimball moved that this committee be authorized to act fully on this matter and to assess any expenses incurred among the membership. At Mr. Gonzenbach's suggestion, any assessments of this character are to be confined to the Wisconsin members, since this legislation concerns Wisconsin only. The motion was carried in its amended form.

At this point a number of invitations were extended to the members. J. R. Cravath, chairman of the Chicago Section of the Illuminating Engineering Society, invited them to attend the meeting of that body on Friday evening, January 22, at the Grand Pacific Hotel, Chicago. Secretary Kimball announced that the management of the Chicago Electrieal Show invited the members to attend the exhibition on the same day. For the Allis-Chalmers Company, L. M. Harvey extended an invitation to all to inspect the West Allis shops of that company on Thursday morning.

Geo. B. Wheeler, of Eau Claire, Wis., called attention to a circular letter sent cut by an Oshkosh firm to electric-light patrons, urging them to buy its safeguard against the great danger from electric wires entering the house. It was needlessly frightening many of his and probably other customers and he therefore urged drastic action on the matter by the association. On motion of Mr. Gonzenbach a committee to take up the matter was appointed; the president selected Messrs. Wheeler and Gonzenbach.

After brief addresses by John Schuette, of Manitowoc, Wis., a charter member of the association, and by Past-president Williams, the session closed with a preliminary discussion of the relations of the Wisconsin State Railroad Commission to the industry. The general opinion was expressed that there had never been anything done for the public-service corporations of that state as fair and beneficial as the public utilities work of this commission.

SERIES TUNGSTEN LIGHTING.

At 2 o'clock the afternoon session opened with the reading of a paper by Henry Schroeder, of the General Electric Company, Harrison, N. J., on "Series Tungsten Lighting." The author called attention to the steadily increasing replacement of arc lamps with tungsten lamps on series circuits. The latter have a much higher efficiency, require little or no attention, and have an exceptionally long life. On account of the thickness and comparative rigidity of the filament this amounts to an average over 1,500 hours. Two advantages result from the high economy of the tungsten lamp: First, the kilowatt-hour saving per year, and second, the extra capacity of the constant-current transformers and station apparatus. The tungsten lamp maintains its candlepower practically constant throughout life. Comparative costs of tungsten and carbon series lamps were given. A new brass disc film cut-out for short-circuiting any lamp in case it breaks or burns out was described. The constant-current transformer was recommended for automatic current regulation. In changing over from carbon to tungsten lamps for street lighting the most common and best practice is to replace twenty-five-candlepower carbon lamps with thirty-two-candlepower tungstens, so as to give the town some benefit from the change and thus easily to secure contracts for additional lamps.

Mr. Schroeder was asked a number of questions relative to tungsten-lamp performance, to which he readily replied. The six per cent drop between initial and ultimate candlepower applies strictly to series tungsten lamps; in multiple lamps the drop is a little greater, because the current is not maintained so constant. Although the average life of the series lamps is about 1,500 hours, a great many have burned 2,000 hours and some even beyond 4,000 hours. Over eighty per cent of the central stations have changed from carbon to tungsten series lighting.

Ludwig Kemper, of Albert Lea, Minn., took issue with the assertion of great saving in plant costs from changing carbon to tungsten lamps. His experience was that it affected the coal pile, lubrication, waste, and labor costs but very little, especially in a small plant. Therefore, the comparative economy practically achieved is much the same for each type of lamp.

This was controverted by Francis W. Willcox, of Harrison, N. J., J. R. Cravath, of Chicago, and Mr. Schroeder, who pointed out that there is bound to be greater economy of fuel from a high-efficiency lamp and, possibly more important still, an increase of load capacity with the same station equipment and a much better satisfied public. Others discussing the subject briefly were G. E. Newman, of Ladysmith, Wis., and President Korst.

COMMERCIAL DEVELOPMENT OF TUNGSTEN LAMP.

The second paper presented was that read by S. E. Doane, chief engineer of the National Electric Lamp Association, on "The Commercial Development of the Tungsten Lamp." The improvements in the tungsten lamp during the past year that it has been on the market have been so marked that today the quality of the lamps produced is far in excess of the manufacturers' first expectations. For multiple service there are at present made seven standard sizes of tungsten lamps for 100 to 125 volts. The regular multiple lamps should not be used in series. Tungsten lamps operate in any position on direct or alternating current. Running at 1.25 watts per horizontal candlepower, the life of the lamps averages over 800 hours, with a final decrease of eight to ten per cent from initial candlepower. This lamp is also less sensitive to voltage fluctuation, and a variable voltage affects its life less than that of any other lamp. Its close approach to daylight quality makes the tungsten lamp valuable where exact color comparisons are important. Pendent or wall switches should be used with tungstens to reduce the shock to the filament from turning on the key. The bulbs should be frosted unless the filament is not near the line of vision. Extensive, intensive, and focusing reflectors are almost exclusively used for tungsten lamps. The importance of properly and periodically cleaning tungsten lamp units was emphasized. The paper closed with a study of the cost of operation of tungsten lamps of various sizes.

Mr. Doane pointed out, in reply to questions, that the lamps can now be burned in any position from vertical to horizontal, since the shrinkage of the filament has been eliminated by present methods of manufacture. He also stated that, in response to a demand for small multiple units for sign lighting, a ten-volt tungsten lamp was being made with the idea of having a small transformer mounted on or near the sign.

J. H. Harding, of La Porte, Ind., brought up the question, whether it is better to rent or sell tungsten lamps. From his experience, it seemed best to sell outright complete tungsten fixtures that were suitable for any particular case after a study of its requirements. In this manner the company's income had been materially increased by the introduction of the new units.

When asked about possible future re-

ductions in the price of carbon lamps, Mr. Doane expressed the opinion that no great change is likely, since the demand for and output of carbon incandescents would doubtless remain at about the present amount for a long time.

Mr. Willcox stated that the original cost of the Gem-type lamps but slightly exceeds the cost of the older carbon lamps and since their economy is better, they would in all likelihood become the standard lamp of the future for short-hour service and out-of-the-way places, while the tungstens would occupy the field for long-hour service.

G. M. Pierce, of Brodhead, Wis., said he had put in tungsten lamps, mostly for flat-rate service, as he figured that the saving from them was in this case entirely his.

O. M. Rau, of Milwaukee, had found as an average a ten per cent reduction in bills where consumers had changed over from carbon to tungsten lamps without increasing the number of lights. To counteract this, his company had very successfully pushed its new-business campaign and had more than made up the difference by the increased load secured.

Mr. Willcox showed that the experience in Brooklyn, Chicago, and other large cities had been that a great increase of revenue results from actively pushing the tungsten lamp.

J. B. Boyd, of St. Louis, Mo., asserted that any central-station manager that allows his customer to reduce his old $10 current bill to $5 is certainly lacking in salesmanship.

Messrs. Korst and Willcox both pointed out the advantages of the rental plan of introducing tungsten lamps. Gas companies have been very successful in renting out gas "arcs;" in like manner electric companies will find it a very good way of overcoming the hesitancy of their patrons in buying an originally somewhat expensive new type of lamp as yet untried by them.

John Schuette, of Manitowoc, Wis., had found that the use of tungsten lamps enables him to give his plant a much larger capacity without physical enlargement.

Former-president Williams, who has a plant outside the jurisdiction of the Wisconsin utilities commission, said his rental plan provided for the regular meter rates for current used plus twenty cents per month for rental of each forty-watt tungsten, thirty cents for sixty-watt, and sixty cents for each 100-watt lamp.

Geo. Loring, of Shelby, Ohio, suggested that a good plan for central stations to follow was to urge the supply dealers in selling tungsten lamps to emphasize the greatly increased light obtainable for the same current instead of the diminished cost for the same amount of light.

Others discussing the subject briefly along the various lines mentioned above were Messrs. Schroeder, Kemper, Cravath and Newman.

COST KEEPING IN THE CONTRACTING DEPARTMENT.

Ludwig Kemper, secretary, treasurer and manager of the Albert Lea (Minn.) Light and Power Company, read the last paper considered in the afternoon. It was entitled "Cost Keeping in the Contracting Department," and described the successful manner in which the company had been enabled to stop unaccounted-for losses in its contracting work by establishing a store-keeping department, with a man experienced in wiring and meter testing as storekeeper. He also acts as timekeeper and repair man for work that is brought into his shop. At the same time quite a simple system of records was adopted that enabled the storekeeper to keep close track of the material and workmen. The results of the whole system have been excellent; the company now knows exactly what each job costs and can charge more equitably for the work. The author urged strongly the adoption of some similar system for even the smallest contracting department.

Discussion of the paper was brief and consisted mostly of questions relative to the details of the plan. Mr. Kemper stated that the storekeeper must be a capable and well-paid man, else the results might not prove as satisfactory as they did in his plant.

THURSDAY'S MEETINGS.

The morning of the convention's second day was given over entirely to an inspection of the West Allis shops of the Allis-Chalmers Company. The trip was directed by L. M. Harvey, of this company, who had arranged to have a special electric car near the hotel. Some sixty members and guests of the association availed themselves of the privilege of this visit. The foundry, machine shops, power house and erecting shop were inspected and, although the time available for this purpose was limited in view of the great extent of these departments, a good general idea of the advanced manufacturing methods and of the great variety and size of the various machines built was readily obtained.

EXTENSION OF ELECTRIC SERVICE TO OUTLYING COMMUNITIES.

The afternoon session was opened at 2 o'clock with the reading of a paper written by J. S. Knowlson on "The Extension of Electric Service to Outlying Communities." In the absence of the author the paper was read by G. B. Wheeler. Within the states of Wisconsin, Iowa, Minnesota and the Dakotas there are now 670 central stations, thirty-nine per cent of which are located in towns of 1,200 inhabitants or less, and there are 188 towns of over 600 inhabitants that do not have electric service. The author showed that, while many of these towns are practically beyond the reach of existing central-station lines, some sixty per cent of them are worth considering as substation possibilities. He discusses two plans for extending electric service to them, one by the formation of a local company that would retail the current transmitted to them wholesale, and the other by the establishment of a regular distributing centre by the producing company. General directions are given for keeping the initial and operating expenses within reason and suggestions for building up the service to its maximum revenue-producing possibilities. The paper was not discussed.

UNIVERSITY EXTENSION COURSES ON PRACTICAL SUBJECTS.

A paper that was read by title and not discussed was that of L. L. Ketchum on "Practical Knowledge for Practical Men." The author is chairman of the educational committee of the Wisconsin State Association of Stationary Engineers, and called attention to the extension work conducted by the University of Wisconsin, largely at the suggestion of this committee, along the lines of steam engineering and other technical branches for the benefit of stationary engineers and others interested in the safe and economical generation of steam as a motive power. This work is being done without interfering with the occupations of the men, partly by correspondence instruction and also by lectures by traveling university professors.

ELECTION OF NEW OFFICERS.

President Korst then called for the report of the nominating committee. This report was presented by Mr. Putnam and adopted by acclamation, the following-named gentlemen being thereby unanimously elected as the officers for the ensuing year:

President—Ernest Gonzenbach, of Sheboygan, Wis., first vice-president and act-

ing president of the Sheboygan Light, Power and Railway Company.

First Vice-President—Geo. B. Wheeler, of Eau Claire, Wis., secretary and general manager of the Chippewa Valley Railway, Light and Power Company.

Second Vice-President—Roger N. Kimball, of Kenosha, Wis., vice-president and manager of the Kenosha Gas and Electric Company.

Secretary-Treasurer—John S. Allen, of Lake Geneva, Wis., manager of the Equitable Electric Light Company.

Mr. Gonzenbach, the new president of the association, has had a varied and extended experience in electrical work. He was born in Switzerland in 1870 and after graduating from a military and technical school there embarked on the seas of strenuous life as a cowboy in the western part of this country. He began his electric-railway experience in the early days of that industry in Chicago, after which he completed the "expert course" in the Thomson-Houston shops in Lynn, Mass., in 1890. Later he engaged in erecting electric plants in Vermont and New Hampshire. After spending two years with the Westinghouse Electric and Manufacturing Company, he became electrical engineer for the Albany and Hudson Railway, and subsequently electrical engineer for the Aurora, Elgin and Chicago Railway. He then engaged in consulting engineering practice, chiefly for the Youngstown and Southern Railway. Four years ago he became general manager of the Sheboygan Light, Power and Railway Company, becoming later also vice-president and treasurer of the company. Last fall, upon the death of Dr. F. A. C. Perrine, Mr. Gonzenbach was made acting president of the company. He is also interested in a number of other electrical properties. In 1903 he received the Octave Chanute medal of the Western Society of Engineers. Mr. Gonzenbach is the author of several articles that have appeared in the technical press, and the inventor of a number of patented railway devices.

CONTROL OF THE ADEQUACY OF ELECTRIC SERVICE.

The next paper considered was that presented by Frank A. Vaughn, electrical engineer of the Milwaukee Electric Railway and Light Company, on the "Control of the Adequacy of Electric Service." In this paper the author considered in detail many of the regulations imposed on electric-lighting companies in Wisconsin by the public-utilities commission relative to meter testing, voltage regulation and lamp policies. A plea was made for uniformity of records and typical forms were submitted for reports on meter tests and troubles or delays to service.

The discussion was opened by Mr. Gonzenbach, who stated that some years before the Wisconsin Railroad Commission had received its enlarged public-utility powers all the meters on his system had been tested and about sixty-five per cent of them found to be reading low. The commission's rules, he believed, were very fair and practically what he had adopted.

Wm. B. Jackson, of Chicago, also declared these rules on the whole to be very just and that the electrical interests of Wisconsin are to be congratulated on the commission's attitude in general and particularly in limiting the inaccuracy of meters to four per cent below standard as well as four per cent above. Therefore the days have gone by when meters running slow are more frequent than fast ones. The new conditions are favorable to both the consumers and the companies. In an extended trip from the East to the West he found that the Wisconsin commission's attitude was regarded as most equitable. He therefore felt proud of what has been done in his old state. The work done by the Milwaukee public-utility company in carrying out the mandates of the commission is praiseworthy and to be regarded as more than an attempt to obey them. A small company may think that it will bankrupt it to keep complete and accurate records of income, expenses, etc., but close analysis has shown that it is beneficial to both the company and the consumer. The chief value of the commission's rules was in fixing the limits of accuracy and in insisting on close accounting of all details of the business. In closing he cited some inefficient conditions discovered in a recent test of a large plant due to lack of knowledge of what was going on.

MR. ERNEST GONZENBACH,
President 1909-10, Northwestern Electrical Association.

J. S. Allen spoke of the economy of making meter tests. The gain resulting from making corrections on ten per cent of the meters more than paid for making the tests on all of them. He has simplified meter tests quite materially by finding out what number of watt-seconds each disc rotation of each type of meter should correspond to; then if any meter on comparison makes, say, not more than twenty-six rotations to twenty-five on the master or standard meter, it comes within the regulation. He thought $2 was too moderate a charge for an accurate meter test.

L. Kemper corroborated Mr. Allen as to the economy of meter testing. As to voltage regulation, he thought that when running near full load it would be feasible to keep within the six per cent limit, but during the day, when the load on a small plant is low, it was scarcely practicable to keep within this margin.

Prof. C. F. Burgess, of the University of Wisconsin, speaking for the engineering staff of the Wisconsin Railroad Commission, said that discrepancy had been charged relative to the rules requiring gas-meter tests but once every three years, whereas electric meters must be tested annually. This was decided upon, however, only after a close study of the characteristics of each class of meters. There was also good reason why electric meters had to be tested at three loads instead of two, since many have an error curve that is far from being a straight horizontal line, although it might pass near two selected points. As there are numerous instances where the calibration of a meter has been changed during installing, the initial test in position is desirable, though in a few cases a hardship. Objection had been made to testing meters in position where only one man runs the entire plant; an appropriate amendment of this requirement might be desirable. A record of the interruptions to service, stating their cause and other facts, is as valuable to the company as it is to the consumer. The six per cent fluctuation limit does not apply to instantaneous effects due to switching or changing-over of machines. Whether it should apply only to hours of lighting load is now being considered. Most companies have been able to operate within the six per cent limit easily. What should be regarded as the normal voltage

in different parts of the system is something yet to be decided. If the practice adopted by the Milwaukee company that Mr. Vaughn represents were generally adopted, it would result in great improvement in the service throughout the state. In conclusion, he advocated that companies should make frank statements to consumers about the relative economy of tungsten lamps, flatirons and other electrical devices.

FUTURE DEVELOPMENT OF PUBLIC UTILITIES.

The last paper presented to the convention was an address, read by Dr. B. H. Meyer, chairman of the Wisconsin Railroad Commission, which now has general control of the public utilities throughout the state. Professor Meyer, as he is generally known, prefaced his remarks by stating that the commission was only an interpreter of the public-utilities law. The regulations it had imposed were the result of careful study and deliberation. If any changes of the rules are desirable, they will be made on a proper presentation of the facts before the commission. The fact that no complaints had been made officially is proof, he thought, that the rules are being lived up to. The main features of the address are abstracted below:

"Assuming that the character of the service and the price to be charged for it have been determined for the present, there must be solved that very imporant problem of the development of the industry which provides this service. In this development the consumer and the investor are equally interested, as well as the general public not directly connected with any particular plant, because the utilities constitute an important part of the industrial life of the state which affects every citizen within it. Bearing upon the question of future development, no provision of the law is more important than the one which provides for profit-sharing and sliding-scale arrangements. The profit-sharing provisions go chiefly to the scale of wages to be paid by the utility, while the sliding-scale provisions go primarily to the rate of return upon the investment as the reciprocal of the rate of charge paid by the consumer.

"The nucleus of the sliding-scale idea is to permit a utility to earn a higher rate of profit in proportion as the price charged by it to the consumer is lessened. For illustration, we may assume an electric-light plant which is at present charging sixteen cents per kilowatt-hour. We will assume, further, that this is a fair and reasonable rate under the conditions under which the plant operates today. As time goes on, this plant, due to efficiency and enterprise in management, extends the list of its consumers, it thoroughly saturates the territory which it serves, it introduces greater economy, it employs more efficient men, and, as a result of all these and other improvements, it is put into a position to furnish light at fourteen cents per kilowatt-hour. If, while the price was at sixteen cents, it was earning only four per cent on the investment, it is quite possible that with the improvements indicated and the growth of its business it may now be making six per cent when the price to the consumer is only fourteen cents. We will still further assume that this same progress in production and management continues until the plant can furnish current at ten cents per kilowatt-hour and that then its rate of profit is eight per cent on the investment. It is apparent that if the management of a plant of this kind operating today under the conditions specified can have before it constantly the incentive of an increase in the rate of profit in proportion as the price to the consumers goes down, no efforts will be spared to bring about this reduction in the price to the consumer in order that a higher rate may be secured for the investor.

"It is probable that sliding-scale arrangements of this kind must be brought about entirely through the voluntary and co-operative efforts of utilities. It is doubtful whether the commission can entirely on its own initiative prescribe and enforce them. Personally, I am firmly convinced that the sliding-scale arrangement is full of promise for the future, and that in it we find the solution of one of the most important factors, if not the most important factor, affecting the development of utility enterprise in Wisconsin. It will prevent lapse and stagnation and tend to keep in places of greatest responsibility the most competent men, the adoption of the best known and approved methods, and the installation of the best types of machinery and appliances.

"The law provides that all such arrangements shall be subject to the supervision of the commission; and it is needless to add that if sliding scales or profit-sharing schemes should be adopted which are on their face unfair to any one or more of the parties in interest, such schemes would be promptly ordered to be modified.

"The time will soon come, if it is not already here, for the commission to call a general conference of representatives of utilities for the purpose of discussing the sliding scale and profit-sharing in their relation to the consumer, wage-earner, investor and the development of the business. A statement of the history of these things would afford a starting point for the deliberations of the conference, and Wisconsin experience would give the discussion direction and shape.

"Closely allied with the arrangements which have just been discussed is the introduction of new methods, machinery, appliances and fixtures. Progress depends very largely upon these, and whatever the interpretation of the law may be in any particular respect, this interpretation should always and inevitably spell progress.

"In very recent times there has been a marked development of waterpower in the State of Wisconsin. The development has scarcely begun.

"To keep out the cheaper current generated by waterpower would be to compel people within the limits of a municipality to pay much more for current than it would be possible to purchase it from the waterpower producer knocking at the city gates. To permit the newcomer to enter the municipal limits without any restrictions or conditions would in most cases probably result in the annihilation of the existing plant. In the one case the whole consuming public would be compelled to pay much more than is necessary, and in the other the investment in the existing plant would be practically destroyed. Neither of these extremes is necessary nor desirable.

"If the management of the existing plant realizes its duty toward the public and if the new comer likewise realizes that its new opportunities and privileges are associated with equally certain duties, the two parties will get together upon a fair and equitable basis by which the existing plant will be utilized to the fullest extent possible, consistent with the full utilization of the cheaper current brought in from without.

"Another important feature affecting future development was suggested by the manager of an electric plant in a small community. In a proceeding before the commission he stated that it was the desire of his company to reach the greatest possible number of consumers at the lowest possible price with the smallest possible investment on the part of the company, and that with this end in view his company was urging customers to purchase high-efficiency lamps of a small

candlepower. He stated it as his desire that consumers in that community use four, eight, ten and twelve candlepower lamps, thereby enabling the poorest people to enjoy the benefits of electric light at an expense within the capacity of their family budget. This suggests one of the most promising lines of development.

"If there is one thing above all others which the history of the utility business has established, it is that competition as a guarantor of good service and a regulator of rates has failed. The verification of this simple truth has cost the people of this and other commonwealths untold millions of dollars.

"The question has repeatedly been raised with respect to the relation of the value of the property of utility plants devoted to public use for rate-making purposes, as compared with the value of the same plants for purposes of taxation. A discrepancy between the two valuations has often been deprecated as on its face demonstrating the existence of a plain injustice.

"At the outset, I am free to admit that the identity of what, for the sake of brevity, I shall designate as the 'tax value' on the one hand, and the 'rate value' on the other, is an ideal condition toward which we should move with the greatest possible speed. I hope the time will come, and I believe that in the not-distant future it will come in Wisconsin, when the value placed upon a utility plant for rate-making purposes will be exactly the value upon which it is taxed, and vice versa. But, as I have said before, this is an ideal toward which to work. It is impossible of accomplishment today. To make the two values identical today would be a gross injustice and inequality in many, if not in most cases."

The discussion of the address was conducted by Messrs. Winslow, Newman, Korst, Allen, Duffy, Jackson, Professor Meyer and a few others.

W. H. Winslow, of Superior, Wis., had drawn up a profit-sharing plan which he was going to submit for approval by the commission.

C. E. Newman thought that Professor Meyer's suggestions relative to profit-sharing and extension of service to small consumers is extremely valuable. He sought the help of the association in suggesting bookkeeping methods that were suitable for very small plants. He urged the association to consider the control of water-powers. Relative to the surrender of old franchises for indeterminate grants, if an extension of time for this purpose is given, most plants will avail themselves of the privilege, as they have come to have implicit confidence in the commission.

J. S. Allen advised the adoption of a voucher system and general ledger scheme as solving the accounting problem for small plants and giving the commission all the information it requires.

C. N. Duffy, comptroller of the Milwaukee Electric Railway and Light Company, said that the commission's uniform-accounting system covers no more than any plant should know about its own business. He recommended the system adopted, as it necessitates keeping separate accounts of the steam, gas, and water-generated current, and therefore permits an exact analysis of the production costs. Mr. Duffy discussed in detail various features of the accounting plan proposed. He suggested the voucher-check system as an abbreviation even of Mr. Allen's voucher plan.

W. B. Jackson asked Professor Meyer what relation the physical value has to the earning capacity of the plant now. Also whether a reserve fund is considered desirable or urged by the commission to tide over hard times, emergencies or other troubles.

Professor Meyer, in closing the discussion, said that in regard to the relation of the physical value to the rate of return it is imperative to know the physical value in order to determine equitable rates. The courts must decide, however, as to whether and how much going value must be considered. The law merely says "all the property used or useful." While reserve funds are desirable, excessive reserves would not be encouraged normally, since in case of emergency the commission was ready to grant speedy relief if the matter is duly presented to it. In regard to the common questions concerning the indeterminate franchises, he regretted that so few companies had surrendered their old franchises for them. When he said that the indeterminate grant was a practical monopoly he meant that the utility company controls its territory absolutely, since any competitor would have to show that it was necessary to enter the field.

After extending a vote of thanks to Professor Meyer, to the officers of the association, the Allis-Chalmers Company for the inspection trip and to others instrumental in making the convention a success, the final regular session was adjourned.

THE ANNUAL BANQUET.

As a fitting close to the convention a very enjoyable "beefsteak dinner" was given on Thursday evening at the Hotel Pfister. Over 100 members and guests of the association attended. C. N. Duffy of Milwaukee acted as toastmaster and introduced Prof. B. H. Meyer as the first speaker. In his address Professor Meyer showed the position of the Railroad Commission as the impartial representative of the law between the utilities on the one hand and the consumers on the other. Amplifying his remarks of the afternoon, he stated that the commission is but trying to carry out the provisions of the law and has a jurisdiction limited by the law. In public utilities the old rules of competition do not apply. In ordinary merchandising discrimination is allowable; in fact it is the mainstay of much business. As the importance of the public faith increases in any business, however, the amount of legislation and public control in regard to it must increase. Therefore the public has a right to control competition in public utilities and, if necessary, to bar the intrusion of an outsider who may act as a pirate in destroying the value of an established utility. The Wisconsin utilities law is unique and the best in the country, because under it there is recourse to the courts from the decisions of the utilities commission, and the testimony taken before the commission stands as the record in any case.

Senator Neal Brown of Wausau, Wis., narrated in his characteristic way how he had acquired his electrical training while mastering the mysteries of an automobile igniter and later while conducting a street railway. He then commented on public-utility control and contrasted the results in Wisconsin with what he termed the hysteria emanating recently from the White House.

Franklin Hobbs of Chicago spoke of the value of advertising to a central station. To get returns from advertising it is necessary to get close to the people and to be perfectly frank and fair with them; in this manner it is possible to get not only their confidence but their friendly patronage and esteem. Mr. Hobbs pointed out some prominent cases of successful and unsuccessful advertising and showed that, whereas an ordinary merchant largely benefits his competitors by his advertising, a public-service corporation having a monopoly in its line gets all the benefits from its judicious efforts in this direction.

The last speaker of the evening was John I. Beggs, president of the Milwaukee Electric Railway and Light Company. Speaking in a reminiscent way of the

growth of the central-station industry during the last twenty-five years he dwelt on the wonderful change that had taken place in the methods of generating and distributing electric current. Within the last two years, however, there has been introduced into this business in Wisconsin an element far more radical than any in the last twenty-five years, namely, the introduction of a supervising partner in the form of the Railroad Commission. He welcomed this radical departure as one of the most valuable acquisitions of the business. The personnel of the commission has won for it the esteem of all interests and accounts for its success compared with similar commissions in other states. "The securities of the public-service companies which I have the honor, or rather burden, of administering, never stood so high as they do today," said Mr. Beggs, "and this in great measure is due to the safeguards which the commission has thrown about capital invested in this sort of enterprise. We have the best rate commission in the country today." Mr. Beggs made an earnest plea for the idea, of which he has for years been a foremost exponent, that a public-service corporation ought to lay up reserve funds out of present earnings to make up for deterioration both because of wear and tear and because of apparatus and equipment becoming obsolete. He said that many of the corporations which have paid big dividends had not really earned those dividends because they were declared at the expense of the company's future expenditures. He advised the delegates to the convention to go home and ascertain the relation between the capitalization of their companies and the actual physical value. If disparity is found he urged that a fund for replacement of apparatus and equipment be begun at once, even at the expense of dividends. It is much easier to distribute dividends than to accumulate a surplus. Mr. Beggs called attention also to the fact that when under the indeterminate franchise law a community avails itself of the right to take over public-service corporations, the appraisement will be upon present values without regard to what may have originally been invested. Unless provisions have been made for the future as time goes on, these companies will find themselves confronted with the prospect of having their properties taken over at a valuation far less than the stocks and bonds represent. Not only must the depreciation reserve be increased, but even the tax funds must be enlarged to keep pace with the steadily increasing taxes.

Quite a number of the delegates to the convention went to the Chicago Electrical Show on Friday, January 22, as the guests of the show management. In the evening several Northwestern men attended the meeting of the Chicago Section of the Illuminating Engineering Society.

Among the men who attended the Northwestern convention in Milwaukee were the following:

P. H. Korst, Janesville Electric Company, Janesville, Wis.; John Wright, Antigo Electric Light Plant, Antigo, Wis.; John S. Allen, Equitable Electric Light Company, Lake Geneva, Wis.; Roger N. Kimball, Kenosha Gas and Electric Company, Kenosha, Wis.; Ernest Gonzenbach, Sheboygan Light, Power and Railway Company, Sheboygan, Wis.; George B. Wheeler, Chippewa Valley Railway Light and Power Company, Eau Claire, Wis.; J. H. Harding, La Porte Electric Company, La Porte, Ind.; H. C. Sterling, Municipal Electric Light and Water Works Plant, New London, Wis.; L. Kemper, Albert Lea Light and Power Company, Albert Lea, Minn.; W. R. Putnam, Red Wing Gas, Light and Power Company, Red Wing, Minn.; W. H. Winslow and P. E. Elevier, Superior Water, Light and Power Company, Superior, Wis.; John Schuette, Electric Light Company, Manitowoc, Wis.; L. L. Tessier, De Pere Electric Light and Power Company, De Pere, Wis.; Ed Daniell, Menominee and Marinette Light and Traction Company, Menominee, Mich.; B. D. Viles, Chippewa Falls Water Works and Lighting Company, Chippewa Falls, Wis.; M. N. Weeks, Electric and Water Company, Grand Rapids, Wis.; F. W. Downs, Washburn Electric Power Plant, Washburn, Wis.; J. R. Dishington, Milwaukee Electric Railway and Light Company, Racine, Wis.; E. P. McCarthy, Peshtigo Lumber Company, Peshtigo, Wis.; G. M. Pierce, Brodhead Electric Light Company, Brodhead, Wis.; Thomas R. Waech, North Milwaukee Light and Power Company, North Milwaukee, Wis.; D. C. West, Beaver Dam Light and Power Company, Beaver Dam, Wis.; Charles M. Cleveland, Wausau Street Railroad Company, Wausau, Wis.; William Wallace, Oshkosh Gas Light Company, Oshkosh, Wis.; W. E. Smith, Municipal Water Works and Electric Light Plant, Columbus, Wis.; Irving P. Lord and E. B. Fisher, Waupaca Electric Light and Railway Company, Waupaca, Wis.; T. A. Pamperin, Peoples Land and Manufacturing Company, Oconto, Wis.; C. J. Partridge and O. B. Williams, White Water Electric Light Company, Whitewater, Wis.; M. S. Sickle and G. H. Kordenat, Platteville Electric Light and Power Company, Platteville, Wis.; W. T. Pomeroy and F. L. Pearce, Edgerton Electric Light Company, Edgerton, Wis.; George Kuehlthau, West Bend Heating and Light Company, West Bend, Wis.; W. B. Voth, Sheboygan Light, Power and Railway Company, Sheboygan, Wis.; O. W. Mosher, New Richmond, Wis.; Wallan O'Connor, Chicago, Ill.; D. C. Pence, Milwaukee, Wis.; B. F. Lyons, Beloit, Wis.; V. E. Extrom, Electricity, Water and Telephone Company, Tomahawk, Wis.; John I. Beggs, C. N. Duffy, Frank A. Vaughn and O. M. Rau, Milwaukee Electric Railway and Light Company, Milwaukee, Wis.; G. E. Newman, Ladysmith Lighting Company, Ladysmith, Wis.; William B. Jackson, D. C. and W. B. Jackson, Chicago, Ill.; Clement C. Smith and H. F. Whitcomb, Jr., Eastern Wisconsin Railway and Light Company, Milwaukee and Fond du Lac, Wis.; Dr. B. H. Meyer, Wisconsin Railroad Commission, Madison, Wis.; Prof. C. F. Burgess, Universitiy of Wisconsin, Madison, Wis.

Among the manufacturers' representatives and supply men were: L. M. Harvey, W. J. Bishop, C. E. Searle and H. A. Balding, Allis-Chalmers Company, Milwaukee; F. T. Andrae and J. C. Schmidtbauer, Julius Andrae and Son Company, Milwaukee; F. W. Willcox, H. Schroeder, J. B. Tingley, C. R. Hunt, H. A. Smith, F. T. Benson, S. F. Dibble, E. L. Barr and E. O. Sessions, General Electric Company, Schenectady, N. Y.; K. A. Albrecht, Charles L. Kiewert Company, Milwaukee; S. Furst, Bryan-Marsh Company, New York; Max Harris, A. L. Eustice, J. J. Sorber and J. B. Griffith, Nernst Lamp Company, Pittsburg, Pa.; H. B. Marshall, Electric Storage Battery Company, Philadelphia, Pa.; J. S. Jackson, International Electric Meter Company, Chicago; J. G. Boyd, Columbia Incandescent Lamp Company, St. Louis, Mo.; S. E. Doane, W. M. Skiff and R. B. Clark, National Electric Lamp Association, Cleveland, O.; J. B. McMullin, Electric Appliance Company, Chicago; George Loring, Shelby Electric Company, Shelby, O.; Ed. H. Taylor, Commercial Testing and Engineering Company, Chicago; W. J. Francis, W. S. Goll and L. M. Page, Fort Wayne Electric Works, Fort Wayne, Ind.; J. W. Robinson, D. E. Webster, Vincent Gray, W. D. McDonald and W. R. Pinckard, Westinghouse Electric and Manufacturing Company, Pittsburg, Pa.

Commonwealth Edison Branch, National Electric Light Association.

At a meeting of the Commonwealth Edison Branch of the National Electric Light Association, Chicago, January 12, the subject, "New Business—How It Is Handled," was discussed by a number of officials of the company. Few persons realize the amount of detail necessary properly to care for a new application from the time it arrives in the company's office to the time the customer receives his first bill. Oliver R. Hogue first described the way in which the application is obtained. J. C. Manley, who has charge of the construction department, told of methods of handling the construction work necessary to give the customer service. A. P. Good, who has charge of the inspectors, described the systematic methods used in his department. C. A. Keller, engineer of station construction, told of the changes often required by the representatives of the contract and inspection departments, making it necessary to draw new plans for station work.

G. W. Lunn, who is responsible for the electrical equipment at the Fisk Street station, explained the operation of producing electrical energy at the switchboard. E. F. Bracken, assistant superintendent of substations, described the training necessary to produce an efficient and competent operator. A. P. Thoms explained the function of the load dispatcher.

INDIANA ELECTRIC LIGHT ASSOCIATION.

SPECIAL MEETING, INDIANAPOLIS, JANUARY 26.

The Indiana Electric Light Association held a special meeting at the Claypool Hotel, Indianapolis, January 26, which was attended by about seventy-five representatives of electric-lighting corporations in the state. The meeting was occasioned by certain legislation pending before the Indiana Legislature, now in session, which, in the event of its passage, would provide the present State Railroad Commission with functions and authority making it co-ordinate with the public-utilities commissions of New York, Massachusetts and Wisconsin, including the regulation of electric-lighting companies.

This meeting was the first held by the association since its organization at Indianapolis, December 24, 1908, and in opening the order of business the president, Thomas C. McReynolds, of the Kokomo, Marion & Western Traction Company, welcomed the members, whose presence gave evidence of their continued support in furthering the interests of the organization. In reviewing the history of the association, Mr. McReynolds spoke of its aims, and in referring to the matter of instituting an Indiana public-service commission, he urged earnest thought and careful consideration on the part of the members. If there is really a demand for creating a public-service commission, he said, let the people and the Legislature understand that the necessity for such a law does not come from the sole purpose of protecting the public against the corporation, but is for the common good of all. The public-service corporation is in need of such a law to protect its interest, its investment and vested privileges, against the uninformed community.

A notable and able address, defending intelligently conducted corporations against the ignorant attacks made by an inconsiderate public, was the talk of Henry L. Doherty, of New York city, on "The Relations of Quasi-Public Corporations to the Public."

Formerly, said Mr. Doherty, the officials of public-service corporations had largely neglected to educate the sense of the public as to the company's services, value, needs and rights, relying upon a final appeal, in case of necessity, to the legislatures and courts for redress. As a result of this failure to meet popular sentiment a popular envy has been engendered, which effects the creation of public-service commissions, feeling that anything which hurts the corporation will help the public.

Much that is unfair is exercised against the corporations of this class. Certain public-service legislation appraises the value of a plant at its selling price rather than an estimate of the material property. Intelligent regulation of service would, in many cases, be welcomed to escape local interference. Mr. Doherty discussed at some length the psychology of public sentiment and compared the moral tendencies of individuals and corporations, asserting that from every consideration that of the second should be higher. By its very nature the benefit of the company accrues to the man of small means, who is thus enabled to share in a business requiring an investment otherwise entirely outside of his financial ability.

The method of "watering" stocks, for which there is a popular verdict of criminality, Mr. Doherty explained in a plausible manner, declaring that men who invest in constructing a waterpower feel assured the development will be worth more than the cash value of the labor and material (else they would not invest), so that it is quite fair to establish the capital stock, not on the invested, but on the presumed, value.

Eventually, said the speaker in closing, public-service commissions may be the solution, but Indiana and her corporations, he thought, are not yet ready. As they may, in fact, be construed, the bills offered permit plants to be managed as well as regulated by public officials, thus throwing the loss of a public failure upon private capital. States which have taken up public-utility regulation are those in which development has already gone far. Such legislation in Indiana, in the opinion of Mr. Doherty, may deter the development of many needed facilities. He counseled delay until the results of the experiments of other states shall be well shown.

In the discussion which followed, several satisfactory reports were made to the association, the general sentiment being that members of the Legislature were not anxious for such a public-utilities bill to be passed at the present session, unless it met the approval of the electric-lighting companies affected, while the Governor strongly opposed any unfair measure.

The paper by R. M. Cass, of the Indianapolis Light and Heat Company, on the subject of "The Tungsten Lamp," considered the veritable revolution that is being effected in central-station work by the introduction of the new high-efficiency illuminant. The speaker directed attention to the effect of tungsten illumination in relegating carbon and metallized-filament incandescent, and, to a certain extent, arc lamps. Mr. Cass believes the problem of fragility of the filament is now solved, with the breakage reports showing only about one-and-one-half per cent during shipment.

As an illustration in favor of replacing arc lamps with the tungsten incandescent, the speaker considered an installation of ten three-ampere, 115-volt arcs to be supplanted with a similar installation of 250-watt tungstens, both installations to burn on an average of five hours per day, 365 days in the year, for ten years. The arc lamps, he computed, would consume about 63,000 kilowatt-hours, while the tungstens would require only 46,000 kilowatt-hours. It is the contention of those in favor of the change that the profit on the lost sale of 17,000 kilowatt-hours, at the present rates for electric power, is not enough to cover the depreciation, interest on investment, maintenance, etc. Some central stations have agreed to furnish the fixtures and first lamps free, in order to secure this class of service. The Brooklyn Edison Company, after exhaustive tests, has gone so far as to insure lamps, taking care of all renewals for $0.25 per month for each 100-watt capacity installed.

In comparing the illumination of a Welsbach four-mantle gas lamp, burning five hours per day, 365 days in the year, and consuming twenty cubic feet of gas per hour, at $0.90 per thousand, with the operation of a 250-watt tungsten lamp for the same time, Mr. Cass showed that, including renewals, the electric lamp would cost $32.07 against $38.05 for the gas lamp. This represents a saving of fifteen per cent, besides securing safer, cooler, cleaner, better and more useful illumination. In the speaker's experience, the life of the tungsten lamp had usually exceeded the warranted 800 hours, reaching an average nearer 1,200 hours.

A paper on "District Heating from Central Stations" was to have been read by S. B. Hofft, of the Merchants' Heat and Light Company, Indianapolis, but as Mr. Hofft was not present, the discussion of the subject was not held.

The next regular meeting of the Indiana Lighting Association will be held August 18. The officers of the association are: Thomas C. McReynolds, Kokomo, president; H. C. Yount, Covington, vice-president; Frederic Leslie, Muncie, secretary and treasurer.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

SWITCH CARRIAGE SYSTEM OF THE FELTEN & GUILLEAUME-LAHMEYER COMPANY FOR HIGH-TENSION DISTRIBUTION STATIONS.

In order to make the operation of high-tension distribution stations highly reliable and to eliminate all danger to attendants the Felten & Guilleaume-Lahmeyer Company has developed a new method of switching, which it names the switch-carriage system. All the high-tension apparatus pertaining to each one of the branch circuits is enclosed in cabinets separated from each other by fireproof insulating walls. Each set of apparatus is placed on an iron carriage, which can be quickly removed from the cabinet and repaired or replaced by another in case of a defect without interfering with the operation of the entire station. The front wall of the cabinets, which forms part of the removable set, carries only the measuring instruments and handles of switches and controllers. A system of locks has been provided which makes it impossible to remove a set of apparatus from a cabinet except by observing a certain order of succession in performing the various operations necessary to accomplish this purpose, and before it has been entirely disconnected. A mistake on the part of the attendant is thus made impossible and all danger is excluded. The space occupied by the cabinets is said to be very small.—*Translated and abstracted from Elektrotechnische Zeitschrift (Berlin), December 24.*

THE BRITISH POST OFFICE RADIO-TELEGRAPH STATION AT BOLT HEAD.

The latest radio-telegraph station belonging to the British Post Office is situated in South Devon, about five miles south of Kingsbridge. Its normal range of communication is 250 miles, but good communication is daily obtained with Scheveningen, Holland, some 350 miles distant. The radio-telegraphic apparatus, mast and aerial were supplied by the Marconi Wireless Telegraph Company, and the power plant, which includes an oil engine, dynamo, secondary battery, switchboard, and the lighting equipment of the building, was supplied by the Westminster Engineering Company. The station mast is built of Oregon pine, in three sections. The lower mast is seventy-three feet long, the top mast fifty-six feet long, and the top gallant mast, fifty-four feet long. With the reduction for over-lap, a total height of 161 feet is provided. Three sets of four flexible galvanized-iron wire-rope stays are provided, the lower stays being three inches in circumference and divided into two sections insulated at three points. The intermediate stays are two-and-one-half inches in circumference, divided into three sections and insulated at four points. The upper stays are two inches in circumference, divided into four sections, and insulated at five points. Four short poles about thirty feet in height are set about 150 feet from the mast, forming the corners of a rectangle, for the purpose of anchoring the aerial wires. The aerial consists of two stranded phosphor-bronze conductors connected at the operating room, but carried upward separately, one on each side of the mast. They are attached at the top to the ebonite-rod insulators, and both conductors are bifurcated, and all four portions extend radially in a downward direction to within fifty feet of the four thirty-foot poles. They are attached to these by ebonite-rod insulators and rope stays. The earth connection is made by means of fifty-two copper leads joined to twenty-six galvanized iron plates five feet by two-and-one-half feet in area, connected together and placed vertically in the ground, and forming a portion of a circle around the operating room. Power is supplied by a ten-horse-power Campbell oil engine, which drives through a belt and friction clutch a three-kilowatt, direct-current dynamo coupled direct to an alternator. The direct-current dynamo provides current for charging the fifty-two secondary cells, for exciting the field of the alternator, and for lighting the building. It is also run as a motor from the secondary cells to drive the alternator when the engine is not in use. The alternator furnishes three kilowatts at 100 volts, at a frequency of fifty. The wave-length of the transmitted signals is 600 metres, but as it may be necessary to signal with a wave-length of 300 metres, a second set of condensers and an oscillation transformer are provided. The Marconi magnetic detector is connected to a switch which is joined to the selected tuning device. As a head-gear telephone receiver is connected to the detector, the coherer and Morse receiving apparatus are not used, for the station is always open, and an operator always listening when not transmitting.—*Abstracted from the Electrical Review (London), January 8.*

THE REGULATION OF ELECTRIC GENERATING GROUPS.

In the course of a serial article on this subject J. L. Routin describes an electro-mechanical governor, which can be used either for regulating the tension or the speed. The apparatus comprises a voltmeter, a system of relays and a motor that actuates the exciter rheostat. From a balancing beam a coil is suspended, on which an electromagnetic downward pull is exerted through a resistance by two other coils connected in the generator circuit. A spring holds the beam in a horizontal position when the tension has its normal value. If the tension is too low, the spring pulls the beam upward and a relay contact is thereby closed, which in turn causes the direct-current motor operating the rheostat to be rotated in such direction that an increase in the exciting current is brought about. When the contact of the relay is broken, its armature short-circuits the brushes of the motor and makes it come to an abrupt stop in consequence of an electromagnetic braking effect. At the same time another electromagnet is energized and re-establishes the equilibrium of the balance beam, the impulse received by the latter being reduced by an air cushion. When the tension is too high, the electromagnet suspended from the beam overcomes the force of the spring pulling it upward, another system of relays is connected in the manner described, the motor operating the rheostat is revolved in the opposite direction, and the exciting current is reduced. It is stated that the weight of the lever can be made small enough and the magnetic effort large enough, so that a variaton of one per cent will produce in less than one-tenth of a second the displacement necessary to put the relays in action.—*Translated and abstracted from La Lumiere Electrique (Paris), December 5.*

THE TELERUPTER, A REMOTE-CONTROL INTERRUPTER.

This ingenious device is intended to light or extinguish electric lamps from a distance and is constructed for circuits carrying currents up to twenty amperes. The control is effected by a battery and circuit of bell wire, and the installation

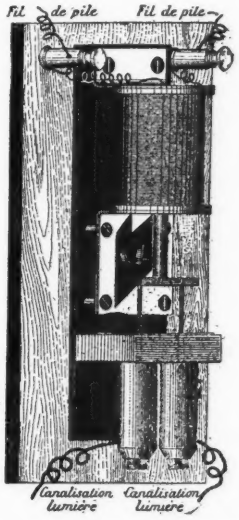


FIG. 1.—THE TELERUPTER.

is therefore not expensive. The telerupter consists of an electromagnet coil, inside of which is a plunger terminating in two spindles at the bottom. Each spindle can enter a small cylinder filled with mercury. The two cylinders are insulated from each other and connected in the lighting circuit, which is closed only when the two spindles enter the mercury (Fig. 1). The operation of the apparatus is

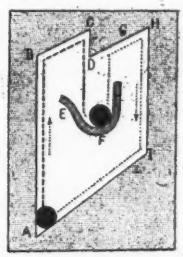


FIG. 2.—PATH OF ACTION OF TELERUPTER.

as follows: The plunger rod carries a projecting finger capable of being displaced in a plane perpendicular to that of the plunger and guided by a piece cut out in a peculiar way (Fig. 2), which compels it to follow the course A B C D E F indicated by the coarse dotted line, or F G H I A indicated by the fine dotted line. A notch F receives the finger and holds it in position. By closing the battery circuit of the electromagnet the lighting circuit may be opened or closed at will. When the finger is at A, the two spindles will make contact with the mercury and the circuit will be closed, and when the finger is at F the circuit will be open.—*Translated and abstracted from L'Electricien (Paris), December 26, 1908.*

ELECTRICAL WINDING IN SOUTH WALES.

The decision to adopt electric winding in the Maritime pit of the Great Western Colliery Company, in South Wales, for which G. J. Hooghwinkel, of London, acted as consulting engineer, was due to the fact that if steam were adopted, a new steam-raising plant, in addition to the winder, would be required. It was found, all things being considered, that the first cost of a complete, independent steam-winding plant would be more than that of a suitable electrical winding plant of similar capacity. The winder was required to wind 175 tons of coal per hour from a depth of 1,110 feet in seventy winds. The empty cage, chains, etc., weigh 10,000 pounds; the two drums, 2,000 pounds; the average coal load, 5,600 pounds. This gives an empty-cage load of 12,000 pounds, and a full-cage load of 17,600 pounds. The weight of the rope on the drum at starting is 1,560 pounds, and that in the shaft, 4,450 pounds, a total of 6,000 pounds. The winding drum adopted is of a special spiro-cylindrical type, with the spiral coiling at a varying rate up the cone, at first rapidly and then more slowly. The smallest diameter is 7.5 feet, and the largest, fifteen feet. It was estimated that the use of this drum would enable the peak load during maximum acceleration to be reduced to under 1,000 horsepower, as compared with 1,450 horsepower with a plain cylindrical drum. The normal rating of the winding motor is 700 horsepower at 2,200 volts, three-phase, twenty-five cycles, fifty-six revolutions per minute. The efficiency is ninety per cent at one-half and three-quarter loads, and ninety-one per cent at full load. There is a rotary converter with a normal rating of 400 kilowatts, three-phase, and 550 volts direct current. There is also a 400-kilowatt, 2,200-350-volt transformer. The flywheel machine has a capacity of 250 kilowatts at 500 volts, and is coupled to a flywheel of 24,000 pounds weight. Its diameter is six feet one inch, and its width three feet six inches. The liquid starter is of a special type, consisting of two large tanks, one of which contains the blades, and the other serves as a reservoir for the liquid. The two tanks are fixed one over the other, and are connected by inlet and outlet pumps, and the water is forced by an electrically driven centrifugal pump from the lower to the higher tank, circulating continually between the two. The overflow is provided in the upper tank, which, if raised, causes the liquid to rise, so that by this means the level can be adjusted. The overflow is mechanically connected to the reversing switch to the main lever on the driver's platform. An emergency three-phase, oil-immersed switch is provided, arranged to break 400 amperes at 2,200 volts, and it is provided with electrical and mechanical overload release and with a trip gear for connecting to the depth indicator, the emergency brake lever, and the no-voltage release magnet. The no-voltage release magnet is a three-phase magnet connected to the secondary of a transformer whose primary is connected to the main high-tension circuit. The magnet acts as a minimum release in case of no voltage, or in case the voltage drops below a certain minimum. A twelve-kilowatt, 2,200-220-volt, three-phase transformer has its primary connected to the main high-tension circuit, and its secondary supplies energy to the brake magnet just described and to the motor driving the centrifugal pump in the liquid starter, and also to a three-horsepower air-compressor motor. The brakes, which are linked to the drum, are operated by compressed air, or, in case of emergency, by means of a heavily weighted lever. The control gear for the load-equalizing set and the flywheel machine automatically regulates the voltage of the machine by varying the resistance in the field circuit. A comparison of the cost of a steam winder and an electrical winder shows a cost of $14,185 for the former, and $14,437 for the latter; or, on a basis of 300,000 tons per annum, 4.46 cents per ton for the steam winder, and 4.62 cents per ton for the electrical winder.—*Abstracted from the Electrical Review (London), January 1.*

Central and South American Telegraph.

A special meeting of the Central and South American Telegraph Company will be held February 5 for the purpose of authorizing an increase of the capital stock from $12,000,000 to $14,000,000, such increase to consist of 20,000 shares of the par value of $100 each, and to determine what directions, if any, should be given to the directors as to the issuing of said stock.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Combination Fixture Stud and Quadrupod.

The Ashland combination fixture stud and quadrupod is designed to be used either for conduit work, molding or open

FIXTURE STUD.

work. The fixture stud has a nipple, three-eighths by seven-eighths, perfectly reamed on both ends, and when used as a quadrupod, it is so constructed that screw holes come in centre of molding

NIPPLE.

so that fixtures will hang perfectly straight. The fixture stud is open so that an open insulating joint can be used, thereby doing away with a hickey

QUADRUPOD.

and saving one-and-one-fourth inches in canopy space.

The Ashland combination fixture stud and quadrupod is made of malleable iron.

The Federal Floor-Box and Receptacle.

A new floor-box has been designed and manufactured by the Federal Electric Company, Chicago, to include many advantages over older models. It is a simple and compact device, only four inches deep and four inches in diameter. The principal feature of its design is a vertical and angular adjustment which permits the floor-plate to be set exactly level

FEDERAL FLOOR-BOX.

and flush with the floor and assures its remaining that way permanently.

The vertical adjustment permits of the raising or lowering of the floor-plate and maintaining it at any certain level. The angular adjustment is made and maintained by three screws, permitting the floor-plate to be set level in case the box is installed at an angle. No extra parts are needed for installing, making this operation very simple indeed.

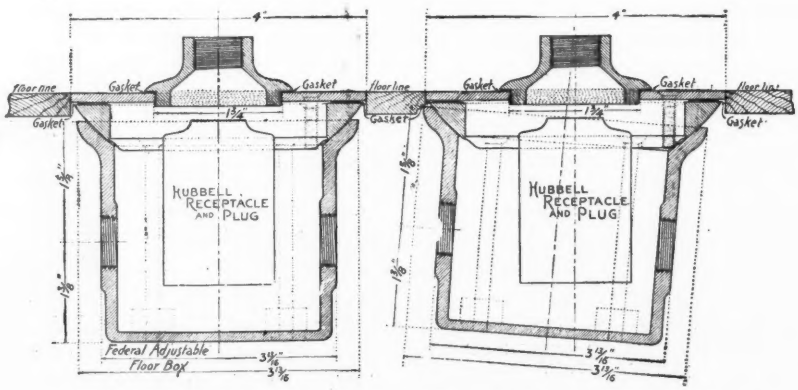
Gaskets under the flange of the nozzle, between it and the floor-plate, and also between the floor-plate proper and the adjustment plate, insure water-tight joints.

The box itself is a one-piece casting. The floor-plate is of brass, highly polished on the upper surface.

An Open-Air-Burning Filament for Electric Heating.

Walter G. Clark, president of the Parker-Clark Electric Company, announces that the open-air-burning filament which was described in the ELECTRICAL REVIEW, Vol. LIII, page 397, has proved to be of great value as a heater element for use in electric flatirons, cookers, grills, and all sorts of heating utensils, as well as for melting-pots for tin, lead, zinc., etc., for heating varnish and other inflammable compounds; and for luminous electric radiators and electric heating devices of every description.

This filament possesses many remarkable qualities. For example, it can be plunged, while burning in ice-cold water or placed in contact with ice without in any way affecting it other than reducing its temperature. It will withstand a temperature up to 1,500 degrees C. Its resistance is fifty times that of carbon of equal cross-section, and it can be made up in any size and in any shape required. On account of its high resistance, a number of these filaments or heaters may be used in parallel instead of one long series of resistance, as is at present used in electric heating devices.



CROSS-SECTION, SHOWING ADAPTABILITY OF FEDERAL FLOOR-BOX.

In the laboratory the filament has burned in the open air at a bright heat for upward of 1,000 hours with no apparent deterioration. It will operate equally well on either direct or alternating current, and can be made for any voltage. Used as a heater it will absorb approximately seventy-five volts per inch of

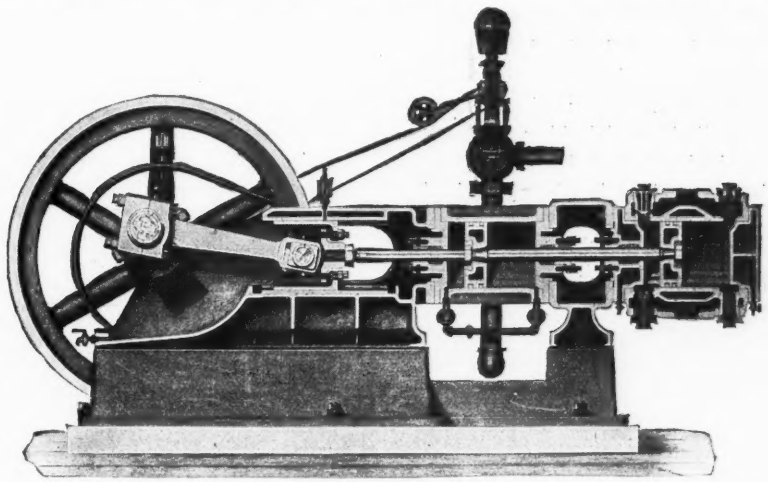
length when in the filament form, using one-half ampere or less.

Mr. Clark announces that the Parker-Clark Company is now preparing to manufacture these filaments on a large scale for use as heaters, and that already negotiations are under way with a number of the companies manufacturing electrical heating devices, who propose to employ the heaters in place of the coil of resistance wire commonly used.

Dallett Air Compressors.

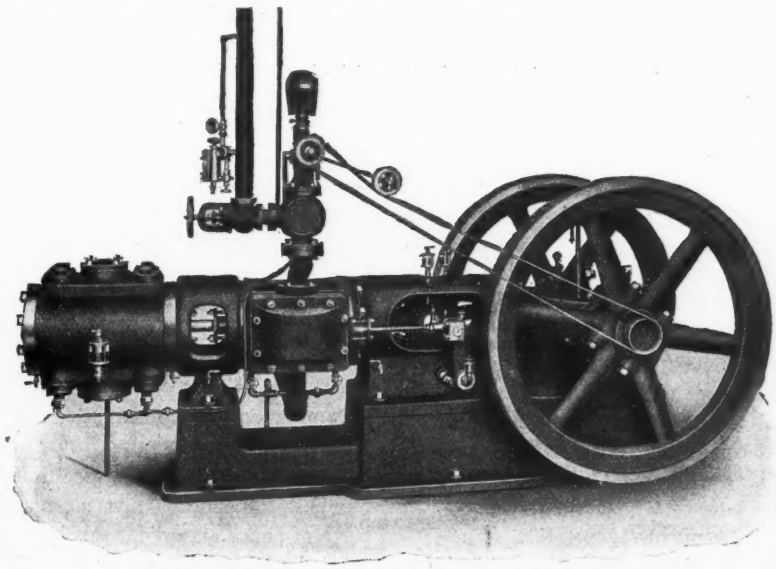
A complete line of air compressors built by the Thomas H. Dallett Company of Philadelphia, Pa., brings out many excellent and unique ideas in compressor design. These compressors incorporate the essential features of having all parts requiring adjustment or removals readily accessible, employing only the best material and workmanship throughout, and using a liberal amount of metal, scientifically placed, to insure rigidity in operation.

The frame is of the open-fork center-crank type, graceful and pleasing in outline, and of an especially massive and rigid design to obtain on each size compressor a greater range of capacity by substituting, when desired, a cylinder of the next larger size than the standard to operate at 100 pounds pressure. For example: On an eight-inch stroke compressor the regular cylinder for this pressure is eight inches in diameter, but a ten-inch diameter cylinder can be substituted and still operate at the above pressure, whereby a greater volume of air is obtained with but a slight increase in cost of machine.



SECTIONAL VIEW OF SINGLE STEAM-DRIVEN COMPRESSOR.

The cross-head guides are cylindrical and are bored at the same setting as the boring and facing of the end which receives the cylinder, insuring absolute alignment. Lubrication is effected by means of high-grade sight-feed devices, or by the gravity or force-feed systems, as desired, and drains are provided for draining off all drippings from guides, stuffing boxes and crank pit.



VIEW OF SINGLE STEAM-DRIVEN COMPRESSOR.

The duplex belt, duplex steam and single steam machines are supported on an exceptionally rigid and deep sub-base, thus making the entire machine self-contained and obviating any possibility of getting out of line, and insuring satisfactory operation on either a rough temporary foundation of timbers, or a permanent one of concrete or brick. An oil gutter is provided around the entire lower base flange on all sub-bases. This insures a clean foundation and floor free from unsightly oil puddles or stains.

The steam cylinder and valve gear of the steam-driven machines are especially suited to the operation of compressors, giving high efficiency with slight attention. All steam ports are short and direct. The clearance has been reduced to a minimum, giving an appreciable saving in steam consumption. A plain D balanced slide valve is used on the small and medium-sized machines, the Meyer balanced adjustable cut-off valve being used on the larger ones. The rocker arms on all valve gears are provided with means for adjustment, doing away with all wobbly movement and unnecessary lost motion. On every steam-driven machine the governor is equipped with a safety stop device, which immediately stops the machine in case the governor belt should break.

In the case of duplex compressors with compound steam cylinders a difficulty has been that if the machine stops with the high-pressure side on the dead centre, which occurs frequently, it will not start automatically, this being due to the fact that but only the high-pressure side takes steam from the line. This trouble has been overcome by using a reducing valve of standard make, which reduces the live-steam pressure for use in the low-pressure cylinder, so that if the high-pressure side stops on the dead center, live steam is fed to the low-pressure cylinder through the reducing valve, starting the compressor. This, of course, is used only when starting, otherwise the operation is identical with any compound machine.

The air cylinders are of a special hard close-grained iron and allowance is made for reboring if necessary. Suitable means are provided to obviate any chance of the air valves being drawn into the cylinder in case of breakage. Each cylinder is

thoroughly tested under hydraulic pressure of 200 pounds before assembling, and all defective castings are eliminated. The clearance space is reduced to a minimum, and all heads and cylinder walls are thoroughly water-jacketed, thus obtaining the highest efficiency possible. Means are provided for draining the cylinder and cylinder head jackets of water to prevent freezing in cold weather. The lubricant is fed directly into the intake passage, allowing the suction to carry the oil into the cylinder in the form of a fine spray. This mode of lubrication has been thoroughly tried and found to give efficient and equal lubrication of all working parts. Any of the "Dallett" standard low-pressure compressors are suitable for vacuum service and can be furnished with mechanically operated inlet valves for a high vacuum.

The cross-head is a new type box pattern made of semi-steel. Its shoes are adjustable and of large bearing surface. The upper shoe is lubricated by means of a sight-feed lubricator and the lower shoe runs continually in a bath of oil. One of the features of this design is the side openings, which allow easy access to the cross-head shoe binder bolts. The cross-head pin is tool steel, hardened and ground. It is fitted to tapered seats in the cross-head, drawn tight on the tapers by means of a nut held in position by a pin. Means are provided for turning one-quarter revolution in case it wears flat on the two bearing sides, thus doubling the wearing capacity.

The air intake and discharge valves have been given most careful consideration and are special features of these compressors. The intake valve is of the automatic poppet type, contained in a malleable-iron cage, combining both seat for the valve and guide for the valve stem. The valve-cage cap acts as a lock nut for holding the cage in place after it has been screwed down on its seat in the cylinder. In the case of a compound machine, corrugated copper gaskets are placed under the valve-cage caps on the high-pressure cylinder to insure against any leakage, as the discharge pressure from the low-pressure cylinder is constantly at these joints.

The valve proper is a special alloy hardened steel, with seat and stem ground to gauge. The valve spring is of phosphor bronze and of a proportion to give the valve an easy opening and a quick closure. Much annoyance and trouble has been caused on certain makes of intake valves, due to the spring holder shearing off or working loose. The cause of this trouble is due to the sudden stopping of the valve on the seat, which tends to drive the spring holder off the valve stem. To eliminate this defect and the trouble caused by threading and pinning the spring holder to the valve stem, solid ends have been employed by some builders, which necessitates a split guide and complicates the valve parts. On the "Dallett" valve the spring holder comprises a split taper ring set into a recess on the valve stem and held together and tight to the stem by means of a solid taper ring slipping down over it. The hammering of the valve on its seat tends to tighten the spring holder on the stem instead of driving it off, due to the action of the taper.

The discharge valve is of the automatic poppet type contained in a valve cage of malleable iron. The method of seating in the cylinder and locking to its seat is identical with that of the intake valve. A projection or boss has been provided on the valve cap which acts as a positive stop for the valve when it has reached a lift, giving a full opening area, and does away with fluttering. The same projection on the cap also acts as a spring guide for the valve spring. Both valves are simple and compact, and each valve requires not over a minute's time for removal complete.

The connecting rod is of the marine type and is made of the best crucible steel. Both the crank pin and cross-head boxes are made of the highest quality phosphor-bronze bearing metal. Adjustment is obtained at the cross-head end by means of a wedge and split box. The crank-pin end is adjusted by removable tin liners, and both bearing surfaces are of extremely liberal proportion, lubricated by wick wipers.

The crank shaft on both single and duplex machines is exceptionally massive, forged out of a solid billet of mild open-hearth steel, carefully turned and polished. In the case of a duplex shaft, the portion in the centre is enlarged to accommodate the heavy flywheel. The wheels on all machines are heavy and of large diameter, insuring smooth operation, and in the case of belt machines the face is very wide. The flywheels on the larger machines have square-cored holes in the rim to facilitate turning over by hand.

The inter-cooler plays a very important part in economical operation of a two-stage machine. The "Dallett" inter-cooler is of large cooling area, employing the return-flow type of water circulation, using baffle plates to detect the flow of the air and aid in its effectual contact with the cooling tubes. This method is very efficient in reducing the temperature of air between stages to approximately the original temperature, thus tending to reduce the final or discharge temperature and also the horsepower required for a given capacity. The nest of cooling tubes may be removed intact from the inter-cooler box without disturbing any of the piping. The inter-cooler is supplied with pop safety valve, pressure gauge and drain valve.

In a compressed-air plant the demand for air is often of such an intermittent character that automatic regulation of the supply of air in accordance with the demand becomes a necessity.

The belt-driven machines are provided with an unloading device which automatically unloads the air cylinder. When a certain determined pressure is reached in the air receiver, one or more inlet valves at both ends of the air cylinder are held open and the load is taken off the compressor, allowing it to run light until the pressure drops in the receiver, upon which the valves are released and air compression is resumed.

On the steam machines a combined speed and pressure governor is used. This governor unloads the air cylinder exactly the same as on a belt-driven machine and at the same time controls the speed, allowing a single steam machine to just turn over when unloaded and bringing a duplex or compound machine to a dead stop. By this means a great saving in steam is effected and the wear and tear on the working parts, as in the case of a continuous running machine, is reduced. A complete unloading equipment is furnished with all machines.

The compressors described are built in sizes from eight-inch stroke up to and including sixteen-inch stroke, and give a range of capacity from seventy-nine to 1,200 cubic feet of free air per minute.

Special machines for any service, capacity or pressure, or any standard machine direct-connected to motor, water-wheel or gas engine can be furnished in addition to the standard line.

Commonwealth Edison $2,500,000 Bonds Oversubscribed.

The $2,500,000 Commonwealth Edison Company of Chicago first mortgage five per cent bonds offered for sale by a syndicate of Chicago bankers, and for which N. W. Harris & Company of New York city received subscriptions, have all been sold, the subscription books closing at 10.15, with the bonds five times oversubscribed.

Current Electrical News

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, JANUARY 23.—The figures for the complete fiscal year of the Mexican Light and Power Company's operations show a surplus of $668,276 gold, after all fixed charges and preferred stock dividends, thus showing earnings at the rate of 5.92 per cent on the common stock outstanding.

Montreal and the south shore of the St. Lawrence will very shortly be connected by an electric road. Within a few months the Montreal & Southern Counties Railway will be running cars into Montreal over the Victoria Bridge.

A proposition to subsidize an electric tram road, from Sydney to East Bay, in Nova Scotia, a distance of eighteen miles, was recently placed before the County Council of Sydney. The promoters ask the county to guarantee bonds and interest amounting to $250,000 in exchange for a mortgage on their property.

Dr. Demers, general manager of the National Telephone Company, plans, at the end of the present month, to call the shareholders of the National company to discuss the proposition of entering the city of Quebec, and connecting the company's north and south shore trunks by a cable between Quebec and Levis. The scheme has already been agreed to by the board of directors, and the shareholders will only have to confirm what has been decided upon. The company would lay underground wires in Quebec and use automatic telephones.

The Queen Victoria Park Commission at Niagara Falls has completed its annual report, to be laid before the Ontario Legislature, but no comment on the international waterways treaty will appear in this report. In regard to the criticism being leveled at the treaty on the ground that the volume of water over the Horseshoe Falls had much greater possibilities for generating electric power than had the American Falls, the chairman of the commission, J. W. Langmuir, said it was true that ninety per cent of the water went over the Canadian Falls, but that, as the water was divided for power purposes some distance above the Falls, it might be very difficult to define the river boundary line. As to 425,000-horsepower, the limit set for generation by Canadian power companies, being likely to prove inadequate to meet the demands of Ontario's industrial expansion, Mr. Langmuir thought the supply would be sufficient for many years to come, and that he could only imagine the capacity being overtaxed in the event of the railroads electrifying their systems in Ontario. It must also be considered that there are electric power possibilities in the Niagara River below the Falls. Some time ago the commission presented a report showing that 200,000 horsepower could be generated below the Falls.

The latest offer of the Toronto Electric Light Company to the city of Toronto, with the view to preventing the city installing a competing electric-light and power plant, has been refused by the board of control. The following were the terms of this offer: The city to have the use of the company's poles, and the company to put up more poles if the city required them; the city to have the use of the company's conduits, the company to construct more if required; the rental for the conduits to be agreed upon on a basis of the cost of construction and maintenance; the city to have the street lighting and that of the public buildings under its management, and to supply power for the city waterworks, and to manufacturers in blocks; the definite number of horsepower in these blocks to be agreed upon; the company to retain the monopoly of house and store lighting, and of contracts for small blocks of power; the company to pay ten per cent dividends on its capital, and the balance of the profits to be used on a reduction of the rates, less the amount of depreciation; a renewal of the company's franchise for thirty years. The city board of control unanimously decided to go ahead with the city's distribution plant, and to carry the civic electric-power project to its completion. W.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, JANUARY 22.—As was expected, D. D. Mann, representing the Winnipeg Electric Company, made another offer to sell out all the company's holdings to the city. The offer was for the city to take over the bonds of the company at current quotations. Failing the acceptance of this offer the company was willing to reduce the price of electric light by twenty per cent providing the city agreed not to construct its municipal power plant at Point du Bois. Both propositions were rejected, and the city at once decided to rush work on the civic power plant and enter into competition with the company in the distribution of electric power. In well-informed circles it is felt that the company is to be congratulated on the refusal of the city to purchase the system, because it is certain municipal power cannot be supplied on a paying basis for the same figure charged by the company. The calling off of the negotiations by the city has resulted in the commencement of a bitter fight between the company and the city. First the company started to lay all its wires under ground, as ordered by the city, but, as the consent of the civic authorities to trench the streets had not been obtained, the work was stopped by the police. The company claims that this exonerates it from having its wires under ground, as ordered by the city last summer.

The Manitoba government has abolished the department of telephones, and in the future the government telephone system will be managed by the Manitoba Telephone Commission. Orrin F. French, chief engineer, has retired, having secured a position with a company operating in the United States.

The Town Council of Swift Current, Saskatchewan, has granted a twenty-year franchise to F. W. Laidley for the supply of electric light and power.

The citizens of Melville, Saskatchewan, are considering the installation of a local telephone system, which will probably be in operation this spring. The Grand Trunk Pacific Railway Company is now completing arrangements to supply the town with electric light and power at a low rate. Address W. A. Campbell, Winnipeg, Man.

In the Saskatchewan Legislature it was announced that another offer had been received from the Bell Telephone Company for the disposal of its telephone system in that province to the government. So far no reply has been sent, but the province is steadily ordering supplies of all kinds for a progressive campaign toward government telephone lines, work on which will be resumed as soon as the weather permits in the spring.

Tenders will be received by H. E. Gillis, city clerk, Calgary, Alberta, until noon, February 18, for the supply of three water-tube boilers equal to 1,000 horsepower, with piping and induced draft system for 2,500 horsepower, one 500-kilowatt generator, connected to a 750-horsepower, high-speed engine, for the railway system, with condenser, switchboard, etc. A check of two-and-one-half per cent will be required. Plans and specifications may be seen in the office of the city engineer.

Tenders will be received by H. E. Gillis, city clerk, Calgary, Alberta, until noon, February 18, for the materials required in the construction of the municipal street-railway system, which will cost approximately $478,000. Plans and specifications may be seen in the office of the city engineer, Calgary, Alberta. A check of five per cent up to $10,000 and two-and-one-half per cent over that amount is to accompany the bid. The list of supplies required includes 1,140 long tons of steel rails, twelve standard cars, sprinkler, sweeper, poles, wire, spikes, frogs, cross-arms, etc.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

TO DEVELOP POWER OF THE ST. LAWRENCE RIVER—The New York & Ontario Power Company has been authorized by the Public Service Commission of the Second District of New York to issue its capital stock of $600,000 and $1,850,000 in thirty-year five-per-cent gold bonds. The company is developing a waterpower project on the St. Lawrence River at Waddington, St. Lawrence County, N. Y.

ELECTRIC LIGHTING COMPETITION IN ST. LOUIS—The demurrer of the Union Electric Light and Power Company to the suit of Circuit Attorney Sager to oust the Union company from the state as a violator of the anti-trust laws, has been sustained by Judge Taylor. Meanwhile, the Board of Public Improvements has issued a permit to the West End Light and Power Company to build an $80,000 conduit under the east side of Grand Avenue, from Manchester Avenue to Lucky Street, which, it is believed, is to be the start of a great underground system, operating lines in competition with the present monopoly. It is believed the company's central power plant will be in Mill Creek Valley, near Grand Avenue.

OCEAN SHORE ROAD TO BE ELECTRIFIED—The Ocean Shore Railroad, running from San Francisco south to Half Moon Bay, and under construction to Santa Cruz, eighty-three miles further, is to be electrified. Originally the road was to have

been an electric trolley line, but the earthquake of April, 1906, which greatly disturbed the roadbed, and later the panic of last year, left the company financially unable to meet the expenses of electrification. The road has therefore been operated as a steam road with a very limited equipment. The new development is a result of the interest taken in the road by men connected with the United Railroads of San Francisco, which recently absorbed the Stanislaus Power Company. The General Electric Company was one of the backers of the Stanislaus Power Company and also holds a contract for the electrical machinery for a steam power plant that was ordered for the Ocean Shore Railway several years ago. The fact that Frank J. Sprague, consulting engineer, as well as other representatives of eastern electrical interests have been examining into the Ocean Shore road and the United Railroads, gives additional interest to the late reports of a union of the two roads. The president of the United Railroads claims that with the completion of the newly-acquired Stanislaus hydroelectric plant and the steam-electric generating plant now under way in San Francisco, the company will have a surplus of 40,000 horsepower. Even at a low estimate the completion of the two generating plants will leave the company with upward of 20,000 horsepower, and this would be available for the operation of the Ocean Shore road. The completion of the generating plants will, according to the estimates, cost about $5,500,000. A.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

ELGIN, OKLA.—The Elgin Farmers' Telephone Company has been incorporated with a capital of $3,000. P.

MARATHON, TEX.—The Marathon Telephone Company has been incorporated by W. J. Newsome and others.

AMITY, ARK.—The Point Cedar & Amity Telephone Company has been organized by J. F. Sheets and others. P.

GRANTS PASS, ORE.—The Citizens Telephone Company has been incorporated with a capital stock of $30,000. P.

LEBANON, MO.—The Laclede County Telephone Company has been incorporated by Martin D. Johnson and others. P.

GRACEVILLE, MINN.—M. S. Stevens and others are forming a company to establish a telephone exchange at Graceville.

HARPER, OKLA.—The Harper County Mutual Telephone Company has been incorporated with a capital stock of $3,000. P.

HARRISBURG, PA.—The Juanita Valley Telephone Company, of Lewistown, has been incorporated with a capital stock of $5,000.

DULUTH, MINN.—The Duluth Telephone Company will install a complete underground system in Duluth, at a cost of $100,000. C.

PLACERVILLE, CAL.—J. A. Fossati and others have petitioned the County Supervisors for a franchise to erect and maintain a telephone line. A.

TWO HARBORS, MINN.—The Duluth & Iron Range Railroad will put in an electric block system of signals from Two Harbors to Highland. C.

TUSCARORA, N. Y.—J. W. Slaight, T. J. Carbrey and J. H. Rowan have incorporated the Tuscarora Telephone Company with a capital stock of $5,000.

SALEM, IND.—The Kansas Telephone Company has incorporated to build and equip a telephone system in Howard Township. Frank P. Martindale, Salem, is president. S.

DIAMOND SPRINGS, CAL.—The Diamond Springs & Hanks Exchange Telephone Company has elected W. W. Hoyt, general manager of construction, and W. S. Voss, secretary.

THIEF RIVER FALLS, MINN.—A mass meeting has voted in favor of city ownership of the local telephone exchange, either buying the present system or building a new one. C.

JAMESTOWN, IND.—The People's Co-operative Telephone Company has incorporated to construct and operate a mutual telephone system in Jamestown and vicinity. George W. Pierson is president. S.

SUMPTER, OKLA.—The Sumpter Telephone Company has been incorporated with a capital stock of $1,000, by Frank Wells, A. W. Newcomb, C. E. Geiger, William Riles and B. Esterday, all of Braman, Okla.

FAIR, OKLA.—The Washita Valley Rural Telephone Company has been formed with a capital stock of $5,000, by W. G. Brymer, J. M. Brymer, both of Fair, D. Brymer of Duncan and M. E. Harris of McKinney, Tex.

FOUNTAINTOWN, IND.—The Readywine Telephone Company has incorporated to construct and operate a telephone system in Fountaintown and Shelby County. R. W. Low, J. E. Gunn, W. E. Reese and J. P. Scott are directors. S.

REDWOOD FALLS, MINN.—The Redwood Falls Electric Telephone Company has filed articles of incorporation to establish an exchange. This is an outgrowth of the fight on the Minnesota Central Telephone Company, which proposes an increase of rates. C.

ST. PAUL, MINN.—The board of aldermen has passed a resolution appropriating $1,000 to defray the expenses of the city in fighting the lawsuit, now pending in the federal court, over the right of the city to regulate the rates of the telephone companies and to fix maximum rates. C.

LINCOLN, NEB.—The Lincoln Telephone Company has completed a merger with the Western Telephone Company, a toll line which connects many independent companies in the eastern part of the state. The new company is capitalized at $2,500,000, only $1,100,000 of which will be immediately paid in.

JASONVILLE, IND.—T. J. McGrew has secured a franchise to construct and operate a telephone system in Jasonville. The Central Union Telephone Company recently absorbed the New Home Telephone Company there and this induced the granting of a franchise to Mr. McGrew, who promises service at a reduced rate. S.

RENSSELAER, N. Y.—The Rensselaer Home Telephone Company has been organized with 250 subscribers. Construction work will be begun with the advent of good weather. Through the Albany Home Telephone Company long-distance telephone service will be had with other independent telephone companies in the state and country.

INDIANAPOLIS, IND.—Attempts to merge the Independent and the Central Union telephone companies operating in New Castle and Crawfordsville have been forestalled by the independent telephone men of the state. The Central Union Telephone Company is apparently willing to give up its city business in exchange for long-distance service. S.

ST. PAUL, MINN.—An opinion has been rendered by the corporation attorney to the effect that a contract between the fire board and the telephone company, whereby the latter is to furnish certain telephones in exchange for using the fire-system conduits for the wires, was in violation of the anti-pass law. A rehearing was granted and the instruments checked up and it was concluded that the number was not too many to justify the arrangement, and that there was no violation of the anti-pass law. C.

SACRAMENTO, CAL.—Senator E. O. Miller of Visalia has introduced a bill in the state Legislature which, if it becomes a law, will provide that the supervisors of each county meet in February of each year to fix telephone rates for the following fiscal year. The bill further provides that the telephone companies shall file statements of their earnings, itemized accounts of their expenditures and an inventory of their property. A violation of the proposed law would make the telephone company guilty of a misdemeanor. A.

PROPOSALS.

HEALDSBURG, CAL.—Sealed bids will be received by the board of trustees, up to February 1, to build an addition to the power house on the Gird ranch. A.

LIGHTING BIDS FOR KENOSHA, WIS.—George W. Harrington, city clerk of Kenosha, Wis., wishes to receive bids for lighting the city and furnishing commercial power and light.

UNITED STATES POST OFFICE AT AUGUSTA, GA.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until March 3 for the construction, complete (except elevator), of an extension to the United States Post Office, Court House, etc., at Augusta, Ga., in accordance with the drawing and specification, copies of which may be had from the postmaster at Augusta or at the office of the Supervising Architect.

UNITED STATES POST OFFICE AT ROANOKE, VA.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until February 23 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office and Court House at Roanoke, Va., in accordance with specifications which may be obtained from the custodian at Roanoke, Va., or at the office of the Supervising Architect.

UNITED STATES POST OFFICES AT WHEELING, W. VA., AND GADSDEN, ALA.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until February 16, for alterations to the Twelfth Street entrance of the United States Post Office, Court House and Custom House building, at Wheeling, W. Va., and the construction, complete, of the post office at Gadsden, Ala., in accordance with drawings and specifications, which may be had at the offices of the respective custodians of the sites, or from the Supervising Architect.

NEW PUBLICATIONS.

REPORT OF ASSOCIATION OF MUNICIPAL ELECTRICIANS.—The complete proceedings of the thirteenth annual convention of the International Association of Municipal Electricians, held at Detroit, August 19 to 21, 1908, has been published in bound form. The book includes the list of officers and members, portraits of officials, and reports of committees.

ELECTRIC LIGHTING.

(Special Correspondence.)

MART, TEX.—An electric-light franchise has been granted to James Nichols. P.

WAXAHACHIE, TEX.—Waxahachie will establish a new electric-light plant.

MAYSVILLE, MO.—W. T. Wingate has been given an electric-light franchise at Maysville.

MISSOULA, MONT.—J. R. Wharton has been granted an electric-light franchise at Missoula. P.

ARTESIA, N. M.—O. S. Coates has been granted a franchise to erect an electric-lighting plant at Artesia. A.

LOGAN, UTAH—The City Council has decided to purchase three new transformers for the city light plant.

TACOMA, WASH.—Tacoma has voted $300,000 in bonds for the construction of a hydroelectric power plant. P.

ABERDEEN, WASH.—The Grayport Electric Company has been incorporated with a capital stock of $6,000. P.

TAYLOR, TEX.—The Citizens Light and Power Company has increased its capital stock from $10,000 to $20,000. P.

NAPA, CAL.—E. D. N. Lehe has been granted a franchise to construct a power line from Calistoga to Union Station. A.

PAYETTE, IDA.—An electric-lighting franchise has been granted to the Idaho-Oregon Light and Power Company. A.

OELWEIN, IOWA—The Oelwein Light, Heat and Power Company will expend $25,000 for improvements this year. C.

PLANO, TEX.—The city of Plano contemplates the construction of an electric-light plant. A. V. Hicks can give information. P.

IOWA CITY, IOWA—A vote will be taken February 10 on granting a franchise to the Iowa City Electric Light Company. C.

PLACERVILLE, CAL.—W. P. Hyatt has appropriated 2,000 inches of water flowing in the north fork of the Consumne River for power and other purposes. A.

SANTA CRUZ, CAL.—Work has begun on the excavation for the new electric power plant to be erected by the San Vicente Lumber Company at Santa Cruz. A.

MAGALIA, CAL.—The power house of the Steifer mine was destroyed by the rush of water after the dams collapsed. The plant is to be restored immediately. A.

OROFINO, IDA.—F. J. Engelhorn, general manager of the Orofino Electric Light Company, reports that the proposed electric-light plant will cost about $10,000.

OROVILLE, CAL.—The new dam of the Oro Light and Power Company at Philbrook Valley burst as a result of the excessive amount of water caused by a recent storm. A.

ROSEBURG, ORE.—The Roseburg Water and Light Company announces that it will this year construct a new plant with a capacity of 20,000 lights at Winchester. A.

HAILEY, IDA.—The Idaho Water and Electric Power Company will build seven dams in the St. Joe River during the next two years, for the development of electric power. A.

LOS ANGELES, CAL.—The San Joaquin Light and Water Company, of Los Angeles, has filed a certificate of the creation of a bonded indebtedness to the amount of $3,000,000. A.

BREWSTER, WASH.—A new company is being formed by D. S. Gamble, F. J. Clifford and C. Y. Rize to purchase the holdings of the Brewster Water and Power Company. A.

OROVILLE, CAL.—The Oro Water, Light and Power Company is constructing a power line through the Central House and Honcut sections to supply power for pumping plants. A.

MARION, IND.—The Indiana Union Traction Company has submitted a bid for lighting the streets of Marion and furnishing electric current for private lighting and power in the city.

SAN FRANCISCO, CAL.—The net earnings of the Northern California Power Company for the past year were $30,000, of which $10,000 went for dividends and $20,000 was added to the surplus. A.

SPOKANE, WASH.—Denton M. Crow has applied for a franchise to build a pole line and erect wires for a distance of twenty-three miles. Power is to be taken from the Inland system. A.

FOWLER, IND.—The Fowler Utilities Company is in the market for a direct-connected engine and generator, meters, transformers, wire, electric drive for deep-well pumps, and a switchboard. S.

CHEYENNE, WYO.—In response to a demand by the city for better street lighting the Northern Colorado Power Company announces that it intends to greatly extend its lighting system at Cheyenne.

EUFAULA, ALA.—The City Council has instructed Mayor McDowell to investigate the cost of an electric-light plant for the city. An engineer will be secured to make plans and specifications.

POTTSVILLE, PA.—Unable to decide whether to retain or sell the municipal electric-light plant, the Schuylkill Haven Council has decided to submit the matter to the people, and a public debate will be held.

SHOALS, IND.—Members of the board of trustees of Shoals are making a trip through central Indiana to inspect several electric-lighting plants, with a view of granting a franchise for a local lighting plant.

STERLING, ILL.—Manufacturing interests of Sterling have formed the Rock River Power Company to develop the water-power in the United States government dam, expecting to develop 8,000 horsepower.

RENO, NEV.—The city of Reno was without lights for a number of days as a result of a snowslide which carried away a portion of the flume supplying water to the plant furnishing the city with electricity. A.

SAN ANDREAS, CAL.—The Mokelumne River Power and Water Company has filed a claim to 5,000 inches of water in the south branch of the Middle Fork of the Mokelumne River, to be diverted into Cadish Ditch. A.

LA GRANDE, ORE.—The City Council has accepted the offer of the American Light and Water Company, of Kansas City, which agrees to furnish all material and install a municipal lighting system for $146,000. A.

SONORA, CAL.—N. Spaulding has filed a claim to 5,000 inches of water, together with ground for the construction of a dam, to be used in generating electric power for milling, manufacturing and other purposes.

ROSWELL, N. M.—At a mass meeting of citizens the advisability of the city owning its own electric-light plant was discussed and the City Council will be asked to issue $18,000 in bonds for the acquisition of a plant.

PORT TOWNSEND, WASH.—The Peninsula Light and Power Company has applied for a franchise to use the available water-power of the Docewallops River for generating electric power to be transmitted to Port Townsend. A.

RENO, NEV.—President F. G. Baum, of the Nevada-California Power Company, asserts that the Reno Power, Light and Water Company will soon be taken over by a new company, controlled by a number of London capitalists. A.

SEATTLE, WASH.—Robert A. Kenzie, general superintendent of the Treadwell Company, states that his company plans to construct an $800,000 electric plant on the Taku River, the electric power to be transmitted to the mines of the company. A.

PASADENA, CAL.—The offer of the Edison Electric Company to sell its plant to the city of Pasadena for $250,000 has been rejected, and preparations are being made to call a bond election for $150,000 to be devoted to building a plant. A.

EUGENE, ORE.—The contract for electrical apparatus for the new municipal power plant has been let to the Portland Machinery Company for $11,512, and the contract for the turbine wheels to the Pelton Water Wheel Company for $19,800. A.

JANESVILLE, WIS.—Plans are under discussion for the furnishing of both power and light to Milton and Milton Junction by the Janesville Electric Light Company. The cost would be about $10,000. Twenty-four-hour service would be given at both places.

TOLEDO, OHIO—The village of Edon has entered into an agreement to secure electric street lighting. A line furnishing current will be extended from Edgerton. The cost to the village will be about $40 per lamp per month, and the lights will be in operation by July 1. H.

FERTILE, MINN.—The Fertile Brick and Tile Company has closed down its electric-light plant, declaring it unprofitable after a five-year run. It is stated that the Council will compel the company to resume business or cancel the franchise and order the poles and wires off the street.

BLOOMSBURG, PA.—B. O. Ellis, of New York city, will be resident manager of the Columbia Light, Railway and Power Company, which is to take over extensive properties in the vicinity of Bloomsburg. It is the intention of the new company to increase the capacity of the present companies and improve their equipment.

SANDPOINT, IDAHO—It is given out that the Washington Water Power Company will expend about $2,000,000 in improvements and in the development of waterpower, $500,000 to be spent this spring. It is proposed to furnish power to local institutions and to supply the Cœur d'Alene mining district, and others using electric power in the towns of northern Idaho. Arrangements have been practically completed by J. J. O'Brien, of Chicago, representing Howard, Simmons & Co. and the H. M. Byllesby Company, of that city, whereby the Pend Oreille Elec-

tric Company will be taken over and make extensive changes in the plants. About 3,000 horsepower will be developed at once. A.

YORK, PA.—While a force of employes from the York Haven power plant dynamited ice gorges in the Susquehanna River about two miles above the plant, more than 1,000 workmen were idle in York through the enforced closing down of seven big manufactories deprived of electric power.

BATH, N. Y.—At a meeting of the board of directors of the Citizens' Electric Service Company, Horace Jones, of the firm of Jones Brothers & Parker, was elected to succeed J. G. Tower as president. The village trustees have given M. J. Burke, the contractor, until May 16 to finish the plant and assume the contract with the village for street lighting.

BOSTON, MASS.—Upon the petition of Robert W. Day, president of the United Electric Light Company, Senator Dickinson has introduced a bill before the Massachusetts state Legislature to limit the amount of territory to one mile of streets each year in which the city shall order the placing of wires and conduits under ground and the removal of poles and overhead wires.

TERRE HAUTE, IND.—F. M. Fauvre, president of the Citizens' Lighting and Heating Company, of Indianapolis, and of the Fauvre Coal Company, of West Terre Haute, has been in West Terre Haute looking over the site of the proposed $1,000,000 electric plant to be erected to supply light, power and heat to all points within a radius of 100 miles. The plant will be located near the Fauvre mine.

MEDARYVILLE, IND.—The town boards of Francisville, Monon and Medaryville have decided to build and equip jointly an electric power plant to supply electric light and power for the three towns, which are about eight miles apart. The plan is to build the plant in Medaryville, the central town, and transmit the current south to Monon and north to Francisville. The population of each town is about 1,200. S.

PROVIDENCE, R. I.—Plans for a new power house to be built on the property of the Atlantic Mills in Olneyville are practically completed. The 8,000-horsepower capacity in steam turbines will be operated without condensers, against a slight back-pressure, since exhaust steam will be required in the departments of the mill. Every department will be operated by electric-motor drive, and the present steam engines scattered throughout the mill removed.

CHICAGO, ILL.—At a session of the board of school trustees of Chicago it was decided to award the school-lighting contract to the Commonwealth Edison Company, but later a quorum was discovered not to have been present at this meeting and the official award will be made at another session within a few weeks. The Sanitary District of Chicago, which operates the Chicago Drainage Canal powerhouse at Lockport, was also an active bidder for the contract.

GRAND FORKS, N. D.—A meeting of the joint committee of the light committee of the City Council and the Commercial Club was held to consider plans for installing the side lights for lighting the two principal streets of the city. Four-light supporters will be installed in each block and on each support there will be one ten-watt and four sixty-watt lamps. New machinery will be installed to provide the current and the present machinery used for lighting other parts of the city. C.

SAN FRANCISCO, CAL.—The Nevada-California Power Company and the Owens River Water and Power Company, who are contending for opposing rights-of-way through Silver Canyon in the White Mountains, are awaiting the decision of the forest service before work can be commenced on either power line. The Owens River company has protested against the approval of the Nevada-California company's application for right-of-way on the ground that the maintenance of the latter line will conflict with its lines.

BUCYRUS, OHIO—Another turn was taken in the troubles of the desired municipal lighting plant for Bucyrus when the Circuit Court reinstated the injunction which the Common Pleas Court had dismissed recently. The injunction restrained the city from issuing $90,000 worth of bonds to build the plant. The City Council took immediate action and is advertising for bids for furnishing lights for city and commercial purposes and for furnishing power. If a satisfactory bid is received a contract will be made and the municipal-plant idea abandoned.

SEATTLE, WASH.—Superior Judge Mitchell Gilliam recently handed down a decision which declared in effect that the Pacific Coast Power Company, a Stone & Webster corporation, which is engaged in building a power plant on White River, has established its right to condemn lands along the river by showing that the waters of the stream were to be devoted to public use. The plan is to impound the waters of White River, which has its source at Mt. Rainier. The present plan is to develop approximately 50,000 horsepower. A portion of the power to be produced will be used in manufacturing enterprises. The current is to be distributed in Seattle, Tacoma and Everett.

MARQUETTE, MICH.—With 1,560 consumers listed on its books, an increase of 165 the past year, Marquette's municipal electric-lighting plant is earning more money at the present time than at any previous period in its history. The net profit for the year is estimated at $32,000, an increase of $2,000 over the record for the preceding twelve months. This showing is in face of the fact that the rates charged for the service are the lowest in the state. The plant is operated by waterpower, and it is managed by a non-partisan board of five business men, who serve without pay.

SPOKANE, WASH.—The Washington Water Power Company plans, during 1909, to expend $3,000,000 in the purchase of equipment and the enlargement of its distributing stations. The sum of $750,000 will be spent on the power plant at Little Falls. Two 1,500-kilowatt motor-generator sets are to be installed at the company's steam-power station, while a substation and a motor-generator station will be built at Cheney. Minor additions are to be made at the substation at Post Falls and two 3,000-horsepower transformers are to be installed at the Twenty-ninth Avenue Station. A.

LIMA, OHIO—C. E. F. Ahlm, of Cleveland, has presented his final plans and estimates for a municipal electric-light plant for Lima. The plans make the plant's cost $46,873, guaranteeing street arc lights at $38.54 a year and commercial lighting at two-and-one-third cents per kilowatt-hour. The city is paying $85 per arc light to the Ohio Electric Railway Company, and commercial rates range from six to twelve cents per kilowatt-hour. The board of public service will proceed to award contracts and start the erection of the plant. Mr. Ahlm says that the plant can be operated, including all salaries, interest and depreciation, at $12,106 a year.

ROSEBURG, ORE.—S. A. Kendall, of the firm of Kendall Bros., of Pittsburg, Pa., owners of the Roseburg water and light systems, announces that his company is to build this year a second power station at Winchester, on the North Umpqua River. The new station will be located two-thirds of a mile below the present one and adjacent to the site for one of the coast's biggest sawmills. The proposed new power station will supply Roseburg and the surrounding country with electric light, while the present plant will be utilized for pumping, and as the head of the water supply. The building and equipment of the new station will require an expenditure of $50,000.

ENGINEERING SOCIETIES.

ARMOUR INSTITUTE BRANCH, A. I. E. E.—The regular January meeting of the Armour Institute Branch, A. I. E. E., held in Chapin Hall, January 21, was addressed by H. Rose on the subject, "Third-rail Practice on Electric Railways." At a special meeting, January 22, in Physics Hall, Dr. H. B. Thomas read a paper on "Resuscitation from Electric Shocks."

CHICAGO SECTION, A. I. E. E.—On January 21 the Chicago Section of the American Institute of Electrical Engineers assembled in the rooms of the Western Society of Engineers to listen to an interesting talk by James N. Hatch, electrical engineer with Sargent & Lundy, on the subject, "The Application of Electricity to the Rapid Handling of Ores." Mr. Hatch had a large number of lantern slides to illustrate his topic.

MEETING OF TOLEDO SECTION, A. I. E. E.—An interesting and instructive meeting of the Toledo Section of the American Institute of Electrical Engineers, was held January 15 at the Builders' Exchange. This was the January open meeting of the society and was well attended. C. E. Bachelder, of Schenectady, N. Y., delivered an interesting address on the subject of "Electricity for Industrial Power with Special Reference to Cement Mills." H.

OHIO ELECTRIC LIGHT ASSOCIATION AT TOLEDO IN 1909—The annual convention of the Ohio Electric Light Association will be held in Toledo next summer. While the date has not been definitely fixed it will probably be late in July. Charles R. McKay, superintendent of light and power of the Toledo Railways and Light Company, is president of the organization, and it is largely through his efforts that the meeting was secured for Toledo. It is expected that between 300 and 400 electric-light men, many of whom will be accompanied by members of their families, will attend the convention. H.

DATES AHEAD.

Chicago Electrical Show. Coliseum, Chicago, Ill., January 16-30, 1909.

Minnesota Electrical Association. Second annual meeting, Nicollet Hotel, Minneapolis, Minn., March 18-19, 1909.

Worcester Mechanical and Electrical Exposition. Mechanics Hall, Worcester, Mass., March 27-April 3.

Omaha Electrical Show. Omaha Auditorium, Omaha, Neb., May 6-15.

American Railway Master Mechanics' Association. Annual convention, Atlantic City, N. J., June.

Master Car Builders' Association. Annual convention, Atlantic City, N. J., June.

PERSONAL MENTION.

MR. W. W. MERRILL, secretary of the Chicago Fuse Wire and Manufacturing Company, returned to Chicago on Monday from a week's trip to New York.

MR. E. KUHLMAN, president and treasurer of the Kuhlman Electric Company, manufacturer of transformers, Elkhart, Ind., was an interested visitor to the Electrical Show.

MR. M. C. GINTEAN, of Los Angeles, Cal., is now traffic manager of the San Francisco, Vallejo & Napa Valley Electric Railway, succeeding Mr. L. J. Perry, who resigned January 1.

MR. HARRY G. LOUSER, superintendent of the Edison Electric Illuminating Company, of Lebanon, Pa., has been made superintendent of the Lebanon Valley Street Railway Company.

MR. W. H. BISSELL has been elected manager of the Livermore Water and Power Company in Oakland, Cal., to succeed D. J. Murphy, of Livermore, who recently resigned. Mr. Bissell was formerly with the Great Western Power Company.

MR. GEORGE A. McKINLOCK, president of the Central Electric Company, and Mrs. McKinlock left Chicago on Sunday, January 24, for an extended trip to the Old World. They intend to spend a good part of their time abroad visiting Spain and cruising in the Mediterranean.

DR. SAMUEL SHELDON, professor of electrical engineering at the Brooklyn Polytechnic Institute, delivered a lecture on "Regulation of Electrical Machinery" at the Edison Auditorium to the employes of the New York Edison Company. The lecture was illustrated with diagrams showing the modern methods used by the leading electrical manufacturers.

MR. L. H. CONKLIN, general superintendent of the West Penn Railways and Electric Company, who is to retire from that position to accept the general managership of the Scranton Electric Company, at Scranton, was presented with a magnificent cut glass punch bowl, stand and base, by H. G. Glass, chief inspector, on behalf of the other officials of the company.

MRS. FRANCES A. W. McINTOSH, formerly advertising manager of the Buffalo Forge Company and associate companies, has resigned that position to open an office for the preparation and printing of advertising literature at 103 Anderson Place, Buffalo, N. Y. Mrs. McIntosh has been very successful in this field and has produced a large amount of excellent advertising literature.

MR. E. W. GOLDSCHMIDT, New York manager of the Wagner Electric Manufacturing Company, and formerly of Chicago, sailed from Antwerp, January 16, on his return to this country after a four-month vacation. Mr. Goldschmidt has been touring the Continent by automobile, after spending a couple of months in southern Italy. Fortunately he left there before the recent earthquake.

MR. ROBERT MATHER, president of the Rock Island Railroad, has been made president of the board of directors of the Westinghouse Electric and Manufacturing Company. This appointment the directors consider a fortunate and well-advised step because of Mr. Mather's long railroad experience, which will be an aid to the Westinghouse company in the work of electrifying railroads.

MR. F. R. BRYANT has assumed charge of the Chicago office of the Crescent Company, Valparaiso, Ind., manufacturers' agent. Mr. Bryant was for a number of years connected with the sales department of the Central Electric Company, Chicago, supervising the advertising department, besides caring for a great deal of sales work. The Crescent Company's Chicago office is located at 103 West Adams Street.

PRESIDENT CHARLES W. ELIOT of Harvard College has been elected president of the Harvard Alumni Association. In accepting the presidency of the association, Dr. Eliot has followed the example set by Edward Everett of the class of 1811, who was president of Harvard College from 1846 to 1849. The first president of the association was John Quincy Adams of the class of 1787, sixth president of the United States.

MR. R. P. GIFFORD, superintendent of the Houghton County (Mich.) Electric Light Company, has been appointed superintendent of the El Paso (Tex.) Electric Light Company, another Stone & Webster enterprise. Mr. Herbert Nash, assistant superintendent, in charge for the company at Calumet, will succeed Mr. Gifford as superintendent and P. A. Staples, contract agent for the past year, will become assistant superintendent, located at Calumet.

MR. GEORGE A. POWELL, who has been associated with the Packard Electric Company, Limited, of St. Catharines, Ontario, for the last fifteen years, severed his connection with that company, December 1. Mr. Powell has started business for himself as electrical commission broker, with offices in the Union Bank Building, Winnipeg, Manitoba. He will continue to represent, among other agencies, the Eugene F. Phillips Electrical Works, Ltd., of Montreal, well-known maker of bare and insulated copper wires and cables; the George Cutter Company, of South Bend, Ind., maker of arc lamp suspension devices, and C. S. Knowles, Boston, Mass., manufacturer of glass insulators, etc.

OBITUARY.

MR. GEORGE W. SHOTWELL, president of the Diehl Manufacturing Company, of Elizabethport, N. J., was taken with hemorrhages early Friday morning, January 22, at his home, 234 Avenue A, Bayonne, N. J., and died very suddenly. Mr. Shotwell was born in Skaneateles, N. Y., and leaves one daughter and two sons.

ELECTRICAL SECURITIES.

The market last week was decidedly irregular, with active changes in the leading electrical industrials. Rumors more or less unfounded occupied a prominent place, and the see-saw of the market could be traced directly to much apprehension as to which way things would really turn. The most persistent rumor has to do with changes in the personnel of the managements of leading railroad corporations, and also in possible and impossible amalgamations and holding operations. The market is also said to be waiting on some court decisions, included in which must be considered the decision of the Public Service Commission in the case of the Erie's application to issue $30,000,000 bonds to take up maturing notes and for other purposes.

Dividends have been declared upon the following electrical securities: Twin City Rapid Transit Company; quarterly dividend of one-and-one-fourth per cent on the common stock, payable February 15. Western Telephone and Telegraph Company; regular semiannual dividend of two-and-one-half per cent on the preferred stock, payable February 1 to stock of record January 20. Edison Electric Illuminating Company, of Boston; regular quarterly dividend of two-and-one-half per cent, payable February 1. American Gas and Electric Company; regular quarterly dividend of one-and-one-half per cent on the preferred stock, payable February 1. New York & Queens Electric Light and Power Company; regular semiannual dividend of two-and-one-half per cent on the preferred stock, payable February 10 to stock of record January 30. Connecticut Railway and Light Company; regular quarterly dividends of one per cent on the common and preferred stocks, payable February 15. Ohio Traction Company; regular quarterly dividend of one-and-one-fourth per cent on the preferred stock, payable February 1. Houston Electric Company, regular semiannual dividend of three per cent on the preferred stock, payable February 1. Helena Light and Railway Company; regular quarterly dividend of one-and-one-fourth per cent on the preferred stock, payable February 1. Harrisburg Traction Company; regular semiannual dividend of three per cent, payable February 1.

ELECTRICAL SECURITIES FOR THE WEEK ENDED JANUARY 23.

New York:	*Closing.*
Allis-Chalmers common	14½
Allis-Chalmers preferred	47½
American Tel. and Tel. Company	125¼
Brooklyn Rapid Transit	70⅛
General Electric	156
Interborough-Metropolitan common	16⅛
Interborough-Metropolitan preferred	44⅝
Kings County Electric	123
Mackay Companies (Postal Telegraph and Cables) common	71⅛
Mackay Companies (Postal Telegraph and Cables) preferred	70
Manhattan Elevated	150
Metropolitan Street Railway	35
New York & New Jersey Telephone	112½
Western Union	68½
Westinghouse Manufacturing Company	83
Boston:	*Closing.*
Edison Electric Illuminating (ex. div.)	252
Massachusetts Electric	59½
New England Telephone	131
Western Telephone and Telegraph pref.	80
Philadelphia:	*Closing.*
Electric Company of America	11
Electric Storage Battery common	44½
Electric Storage Battery preferred	44½
Philadelphia Electric	12
Philadelphia Rapid Transit	27½
United Gas Improvement	92½

The gross earnings of the Philadelphia Rapid Transit Company increased $23,000 in the first fourteen days of January.

Chicago:	*Closing.*
Chicago Telephone	——
Commonwealth Edison	107
Metropolitan Elevated preferred	49
National Carbon common	84
National Carbon preferred	109

The $2,500,000 Commonwealth Edison Company first mortgage five-per-cent bonds offered for sale by a syndicate of Chicago bankers, and for which N. W. Harris & Company of New York city received subscriptions, were sold in one day. The subscription books closed with the bonds five times oversubscribed.

ELECTRIC RAILWAYS.

(Special Correspondence.)

INDIANAPOLIS, IND.—During the past year 96,668 round trips were made by the interurban cars out of Indianapolis. S.

ELIZABETH, N. J.—The Clinton Hill Cemetery Association is seeking privileges to build a trolley line from Clinton Hill to Millburn.

SAN JOSE, CAL.—The San Jose Traction Company has applied for a franchise to construct a street railway in the streets of the city. A.

WICHITA FALLS, TEX.—Judge Edgar Scurry has asked the City Council for a franchise for an electric street railway, to be built within six months. Work will be commenced at once.

SACRAMENTO, CAL.—The board of trustees is drawing up franchises relating to the water-front privileges which are to be granted to the Northern Electric and Central Traction companies. A.

FT. WAYNE, IND.—The officials of the Ft. Wayne & Wabash Valley Traction Company are considering the style of new cars to be purchased soon. About forty cars will be required, the officials say. S.

STAMFORD, CONN.—The Marine Railways and Construction Company has filed a certificate of incorporation. It has a capital stock of $10,000, and the incorporators are Harry F. Smith, William J. Smith and Howard R. Waterbury.

CITRONELLE, ALA.—A movement for an electric railway between Citronelle and Mobile is being promoted by George N. Bressler, of Mobile. Capitalists behind him require 10,000 acres of land, and property holders have already subscribed all but 1,100 acres of this amount.

DECKER'S CREEK, VA.—The Decker's Creek & Cheat River Railway Company, which is seeking a franchise from the Monongalia County Court, expects to construct a trolley line from Morgantown to Cheat River in the vicinity of Ice's ferry and thence to Point Marion, a distance of sixteen miles.

WOODSTOCK, ILL.—The Woodstock & Sycamore Traction Company, which is building an electric line between the cities named, has secured a loan of $700,000 with which to complete the construction of the railway. The proposed route is via Genoa and Marengo and is considered a valuable project.

INDIANAPOLIS, IND.—At the annual meeting of the stockholders of the Indianapolis & Cincinnati Traction Company, the old board of directors was re-elected. The directors then elected the following officers: President, Charles L. Henry; vice-president, Theodore F. Rose; secretary, J. F. Wild; treasurer, John J. Appel. S.

NEWCASTLE, IND.—Arrangements are now being made by the investors and receiver for the early completion of the Indianapolis, Newcastle & Toledo Traction Line. This road was almost completed a year ago, but was suffered to go into a receivership. The property has deteriorated during the suspension of work. S.

KOKOMO, IND.—C. C. McFann, president and general manager of the Kokomo Western Railroad Company, announces that work on the construction of a line from Kokomo to Burlington will be commenced soon. At Wildcat River a high bridge 150 feet long will be required. The company expects to use gasolene-motor cars at first. S.

MADISON LAKE, MINN.—The Commercial Club is trying to secure the construction by the Mankato Street Railway Company of an electric railway from Mankato, to be extended to Northfield later. H. E. Hance, one of the directors of the railroad company, proposed that the line be built by the way of St. Peter and Lakes Emily and Washington. C.

PHILADELPHIA, PA.—Members of improvement associations of northeast Philadelphia have decided to continue the campaign for a trolley system to run on Bustleton Pike between Frankford and Bustleton and for the proposed elevated railroad to Frankford. Closing the meeting Dr. C. J. Lewis was re-elected president and J. C. Tuslin, secretary,

AUSTIN, TEX.—The Stamford & Northwestern Railway Company, of Stamford, Jones County, capitalized at $170,000, has been chartered, the proposed road being from Stamford to Plainview, a distance of about 165 miles. The general offices of the company will be located at Stamford, and its directors and incorporators are headed by W. T. Andrews.

WINNIPEG, MANITOBA, CANADA—The City Council has decided to consider the proposition of allowing the Winnipeg Street Railway Company to sell out its interests. The street-railway, light and power plants are estimated to be worth from $15,000,000 to $20,000,000. William Mackenzie and D. D. Mann, who are at the head of the Canadian Northern Railway, are principal owners of the street railway. There appears to be a division in opinion as to whether the city of Winnipeg should proceed with the building of the Point du Bois works or purchase the electric street-railway system. Whatever the outcome of negotiations now on between the city and the directors of the railway company, the fact is clear that Winnipeg is to have cheap power for manufacturers.

HELENA, ARK.—After numerous amendments the City Council has granted the franchise for a street railway in Helena, which was asked by J. W. Burks. The first half-mile of track is to be laid within sixty days, and all service in Helena proper is to be completed by January 1, 1911. Charles S. Hernly, of Indianapolis, Ind., heads the capitalists who will build the road.

AUSTIN, TEX.—Believing that by this plan a thousand more boys may be accommodated at the Agricultural and Mechanical College, W. C. Davis, representative from Brazos, will introduce a bill in the early part of the session of the state Legislature calling upon the state government to construct a trolley line from the college to Bryan. The cost of the line will approximate $70,000.

MEXICO CITY, MEXICO—Announcement is made by the Mexico Tramways Company that it has purchased control of the Mexican Light and Power Company, Limited, by an exchange of shares in the ratio of eight shares of the purchasing company to fourteen Mexican Light and Power Company shares. Minority shareholders will obtain the same terms of exchange as the large holders, provided the offer is accepted prior to February 15.

HELENA, ARK.—Articles for the incorporation of the Helena Street and Interurban Railroad Company have been filed with the secretary of state. The company is organized to construct an electric railroad in Helena. The company has a capitalization of $25,000, all of which has been subscribed and $12,500 paid in. J. W. Burks is president of the company; Charles S. Henry, vice-president, and J. W. Vineyard, secretary and treasurer. B.

ELDORADO SPRINGS, COLO.—The Eldorado Springs Railway Company, a recent corporation of Denver business men—W. W. Seaver. C. W. Clark and Frank Hawley—is to begin the immediate construction of an electric railway from the springs up the mountain side on the north. In winding backward and forward up the steep ascent an elevation of several hundred feet will be attained in going one-and-one-half miles, the approximate length of the line.

ALLENTOWN, PA.—Arrangements have been concluded for a new trolley line between Reading and Allentown. The Intercity Electric Railway has been organized with $500,000 capital, which has been subscribed largely along the proposed route. Maxwell H. Bochow is president of the company; Joshiah Fisher, secretary, and Bateman Saddington, treasurer. The entire right-of-way has been procured. The line will be thirty-five miles long, running by the way of Lyons, Tipton and Emaus.

TOLEDO, OHIO—The Ohio & Michigan Railway Company, of which Andrew E. Lee is president, has purchased the Michigan end of the Toledo & Ann Arbor line, which was in process of construction, and the work of completing it is progressing rapidly. After several weeks of negotiation for the purchase of the Ohio end of the line it has been determined to abandon this plan and come into Toledo over a new route. It is expected that cars will be in operation some time in March. H.

YELLVILLE, ARK.—The Commercial Club has received a proposition from eastern capitalists to secure the right-of-way for an electric line from the Rush mining camp to Yellville. A committee appointed by the club has secured most of the required right-of-way and the balance, it is thought, can be easily secured. It is the intention to extend this electric line from Yellville to all the mining camps in that district. It is expected that work on construction will be begun in sixty days. B.

CLEVELAND, OHIO—The Central Trust Company, of New York, which threw the Cleveland Traction System into receiver's hands, has petitioned the Federal Court to raise the rate of fare to the limit allowed by the old ordinances. The request is made on the ground that the Municipal Company owes $400,000 and that the receivers have lost $125,000 because of the three-cent fare. This will practically mean the abolition of transfers in this city and various rates of fare from three cents to eight cents.

ROCK ISLAND, ILL.—The Galesburg & Rock Island Traction Company has been incorporated with a capital of $10,000 to construct an interurban road through Warren, Knox, Mercer and Rock Island counties to Galesburg. The incorporators and first board of directors are: William E. Woodward and Warren Everett Elliott, of Chicago; Frank H. Clarke, Springfield, Ohio; R. V. Field, Galesburg, Ill.; Warren C. McWhinney and Robert P. McGeehan, Kansas City, Mo., and Earle P. Field, Monmouth, Ill. C.

BENNINGTON, VT.—Application has been made to the Legislature for the franchising of the Otter Creek Valley Railway Company to construct a trolley road from Rutland to Wallingford, fourteen miles, extending southerly to Bennington. The Legislature has granted a franchise for an electric road between Essex Junction and Montpelier. There are eleven electric rail-

roads in Vermont, but with the exception of the Bennington & North Adams they are without connections. The longest road, that of the Rutland Railway, Light and Power Company, has a trackage of twenty-three miles.

ANDERSON, IND.—The Indiana Union Traction Company has entered on the work of remodeling all its cars. The cars intended for limited service will be extended to be sixty feet in length, and the vestibules will be enlarged. The company has recently turned out from its shops one of the finest cars ever put in service. It is sixty-two feet long, and has a baggage and express compartment, a smoker and a ladies' compartment, and an observation vestibule, and is equipped with Baldwin trucks, geared to sixty-five miles an hour. Mahogany chairs, leather-upholstered, high-back seats, silk tapestries and rich blue carpets add to its superb appearance. S.

TOLEDO, O.—The stockholders of the Toledo Railways and Light Company, at their annual meeting in Toledo, have retained the official staff, as follows: President, Albion E. Lang; vice-president and general manager, L. E. Bielstein; secretary, H. S. Swift; treasurer, S. D. Carr. An important feature of the meeting was the ratification of a contract by which the Toledo, Fostoria & Findlay Electric gains an entrance into Toledo, and the election of the following board of directors: S. D. Carr, Jay K. Secor, W. J. Walding, Irving B. Hiett, John J. Barker, Albion E. Lang and L. E. Bielstein, all of Toledo, W. E. Hutton of Cincinnati and Dr. J. F. Deemers of Quebec. It was also decided to furnish universal transfers on all lines upon the payment of a five-cent cash fare, the new plan to be installed at once. The business of the year shows a decrease of $23,089.27 as compared with 1907, the gross receipts being $2,542,111.38. Operating expenses were reduced $68,953.53 as compared with the preceding year, being in 1908 $1,473,379.79, including taxes. Interest charges on bond and floating deft were $755,424.66, leaving a net income of $313,306.93, or 2.26 per cent on the capital stock of the company. H.

NEW MANUFACTURING COMPANIES.

LANSING, MICH.—The Detroit Electric Manufacturing Company, of Detroit, has been incorporated with a capital stock of $100,000.

BOSTON, MASS.—The Onaway Telephone Company, of Boston, has been incorporated, with a capital stock of $50,000, by A. B. Grover, Winchester, and C. E. Lock, Pawtucket, R. I.

NEW YORK, N. Y.—William B. Ribbett, of Whitestone, is a director of the Scenic Electric Manufacturing Company, of New York city, newly incorporated with a capital of $5,000.

NEW YORK, N. Y.—The Sieman's Magneto Company, to manufacture electrical machinery, has been incorporated, with a capital stock of $50,000, by Joseph Finkelstein, Barnet Weinstein and Hyman Chernoff, of Brooklyn.

NEW YORK, N. Y.—The Acme Metal Manufacturing Company has been incorporated to manufacture electric advertising signs. The capital of $5,000 is subscribed by L. Betts Hengerer, James H. Betts and Charles D. Winters, 320 Broadway.

INDUSTRIAL ITEMS.

THE SMITH CHANDELIER COMPANY, Detroit, Mich., illustrates a number of tasteful electric and combination fixtures in a complete catalogue of Smith's "Specials," No. 2.

THE WESTERN ELECTRIC COMPANY, Chicago, gives an account of its three-wire generators, of L design, in bulletin No. 5113. The construction of the machines is illustrated in detail.

THE H. KRANTZ MANUFACTURING COMPANY, Brooklyn, N. Y., has issued several additional filing leaves, comprising a list catalogue of its knife switches and panel-board parts. The bulletin contains descriptions and list prices of all material.

THE RAIL JOINT COMPANY, New York, N. Y., illustrates the various types of rail joints of its manufacture, for connecting girder and tee rails, in a well-arranged pamphlet just sent out. The company announces that 50,000 miles of its base-supported rail joints are in use.

THE WAGNER ELECTRIC MANUFACTURING COMPANY has opened a sales office in the Trust Building, Charlotte, N. C., to assist in the care of its rapidly growing southern business. The Wagner company's other office in the South is at Atlanta, Ga., and the factory and main office are in St. Louis, Mo.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., issues its complete general catalogue for 1909, of the variety of electrical supplies carried in its large stock at the warerooms, 264 to 270 Fifth Avenue, Chicago. This catalogue, No. 26 in the series of the company, which was incorporated in 1887, is a substantial volume of 1,014 pages, and is fully illustrated and complete with list prices.

THE METROPOLITAN ELECTRICAL SUPPLY COMPANY, 184 Lake Street, Chicago, Ill., announces that there has lately been some confusion in connection with the company of the same name located in New York city, against whom a petition in bankruptcy has recently been filed. The Chicago company has no connection whatever with the New York concern.

THE ROBBINS & MYERS COMPANY, Springfield, Ohio, made one of the hits of the Chicago electrical show with its "Standard" motor driving a submersible bilge pump. Full information may be obtained upon request. The company has made additions to its very comprehensive line of fan motors for 1909 and data upon these should be obtained by those interested.

THE FRANKLIN ELECTRIC MANUFACTURING COMPANY, Hartford, Conn., is directing a strong appeal to the electrical industry in a recent letter on the tungsten lamp in twenty-five, forty and sixty-watt sizes. The company announces, also, that the output of its two factories, at Hartford, Conn., and Middletown, Conn., is over two-and-one-half million incandescent lamps a year.

THE BLAKE SIGNAL AND MANUFACTURING COMPANY, Boston, Mass., in presenting its Blake tube flux announces that it has prepared in this product a thoroughly insulating, absolutely non-corrosive soldering flux, put up in a convenient, useful and economical form. The spout in the tube is aluminum and allows the paste to be applied directly to the joint at the same time with the heat without soldering up the vent.

THE PETTINGELL-ANDREWS COMPANY, Boston, Mass., in each issue of its house monthly, *Juice*, shows new goods which it will be impossible to get into the catalogues earlier than from three to six months. Subscriptions are given free to anyone who requests that his name be entered on the mailing list, provided inquiry is made on business stationery. Requests should be addressed to the publicity bureau of the company.

THE EXCELLO ARC LAMP COMPANY, New York, N. Y., announces through its western manager, G. W. Armstrong, that it has increased its sales organization and has added to its publicity and engineering department. It will be the function of the latter to analyze the operating characteristics of existing Excello installations, so as to have prepared data upon engineering, installation, cost and maintenance of flaming arcs for every condition of commercial and industrial lighting requirement.

THE STERLING ELECTRIC COMPANY, Lafayette, Ind., announces that on Saturday, January 9, a decision was rendered by Judge Kohlsaat in its favor, it being the plaintiff in the suit brought against the Western Electric Company, asking the court to set aside a patent covering a multiple switchboard granted to Mr. McBerty, and praying that Samuel B. Fowler be declared the original inventor. The company states that Judge Kohlsaat's decision holds that Fowler's contentions are sustained beyond reasonable doubt.

GULICK-HENDERSON & COMPANY, inspecting engineers, foundry specialists and chemists, with general offices at Pittsburg, Pa., have opened a western office and laboratory in the Manhattan Building, Chicago, in charge of Ward O. Collins, who is a new member of the firm. Mr. Collins was for many years connected with the Chicago office of Robert W. Hunt & Company. More recently he was a member of the firm of Collins & Stevens, making a specialty of inspection and general engineering work.

THE HOLLOW CONCRETE POLE COMPANY, Oklahoma City, Okla., in an illustrated booklet on the advantages of its reinforced hollow concrete poles for telephone, telegraph and power purposes, submits a proposition to sell county rights for the manufacture of poles under its patents. It is cheaper, as explained, to manufacture the poles in the city where they are to be used. These poles successfully withstand decay, fire and injury from animals. As the poles are hollow, drop wires in residence sections are carried down inside the pole, avoiding unslightliness and exposure of wires to weather and tampering. F. H. Tidnam is the patentee.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has issued several new bulletins of equipment it has lately introduced. Pamphlet No. 3728 gives, by means of tables and curves, a brief exhibit of the value and economy of tungsten series street lamps, showing the marked saving over the carbon and Gem lamps, and the possible gain in income. It shows the rate at which the tungsten lamp is able to compete with Welsbach gas street lamps, the economical life of the tungsten lamp, and the candlepower and life performance of the tungsten series lamp. In preparing a bulletin to serve as a guide to the design of medium and small-capacity central-station switchboards, an effort has been made to discuss only representative cases, pointing out both the desirable and undesirable features. The bulletin, which is numbered 4638, goes into details, giving the arrangements, dimensions and connections of various styles of boards. In bulletin No. 4642 there is described a new trolley base designed especially to fulfill the requirements resulting from the increased speed of interurban cars and the consequent severe conditions. The base is light, strong, and so sensitive

that it not only permits of sharp turns at high speed without danger of throwing the trolley wheel from the wire, but, by eliminating the arcing, pounding and wrenching, inherent in ordinary forms, insures a minimum wear on trolley wheels.

THE GREEN FUEL ECONOMIZER COMPANY, Matteawan, N. Y., calls attention to the fact that equipment for power plants and industrial works is taking the lead in the resumption of business. This is well brought out by a partial list of its recent sales of fans, blowers and exhausters, issued by the Green company. These fans are to be used for such purposes as mechanical draft, heating and ventilating, hot-blast drying, etc., and their number indicates that many mills and other plants are being put into shape in anticipation of manufacturing operations on a large scale: Grand Rapids Refining Company, Grand Rapids, Mich.; St. Joseph Railway, Light, Heat and Power Company, St. Joseph, Mo.; Public School No. 1, Oceanic, N. J.; J. Ruppert Brewing Company, New York city; S. S. White Dental Manufacturing Company, Princes Bay, S. I.; Atlantic Sewerage Company, Atlantic City, N. J.; New Bijou Theatre Company, Atlanta, Ga.; Bigelow Carpet Company, Lowell, Mass.; American Manufacturing Company, Brooklyn, N. Y.; Masonic Building, Somerville, Mass.; Lincoln School, Racine, Wis.; Draper Company, Hopedale, Mass.; Bartlett, Kuhn & Company, Terre Haute, Ind.; Peoples Gas and Electric Company, Burlington, Iowa; United States Navy Yard, Mare Island, Cal., and a great many others.

THE SUNBEAM INCANDESCENT LAMP COMPANY, Chicago, has moved its sales office and warehouse from 32 West Polk Street to the Western Electric Company Building at 259 South Clinton Street, Chicago. This change was made as larger quarters were needed to take care properly of the increased volume of business being handled by both the Sunbeam company and the Western Electric Company since the introduction of the Sunbeam tungsten lamp. The Sunbeam product is well and favorably known, having been on the market continuously for twenty years. The complete line manufactured consists, in addition to regular lamps, of Gem, tantalum and tungsten-filament lamps of all styles, candlepowers and voltages. The entire output of the Sunbeam Incandescent Lamp Company is distributed through the Western Electric Company, Chicago or New York, and its various branch houses throughout the United States.

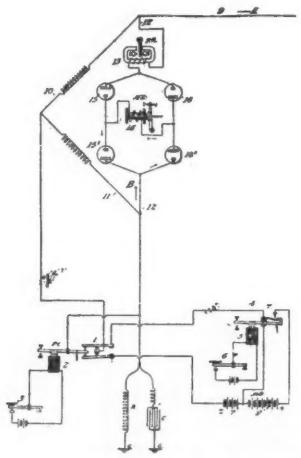
RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) January 19, 1909.

909,872. ELECTRIC ELEVATOR. William M. Cummiskey, Honesdale, Pa., assignor to Howard F. Gurney, New York, N. Y. Filed June 5, 1908. A resistance in series with a solenoid for cutting out the starting resistance of the motor is short-circuited by the releasing of the brake.

909,877. TELEGRAPHY. Thomas A. Edison, Llewellyn Park, Orange, N. J. Filed June 20, 1907. In combination with a neutral relay is a series of rectifiers in circuit therewith and arranged so as to commutate currents of reversed polarity, whereby all will pass through the relay in the same direction.

909,889. ELECTRIC ELEVATOR. Howard F. Gurney, Jersey City, N. J., and William M. Cummiskey, Honesdale, Pa.; said Cummiskey assignor to said Gurney. Filed February 26, 1908. The general control system, of which number No. 909,772 is one feature, is described in detail.



909,877.—ALUMINUM RECTIFIERS FOR TELEGRAPH CIRCUIT.

909,896. ELECTRIC VAPORIZER FOR INTERNAL-COMBUSTION ENGINES. Harry Hertzberg, New York, and Abbot A. Low, Horseshoe, N. Y.; said Hertzberg assignor to said Low. Filed February 11, 1907. Comprises a chamber provided with an air inlet and an electrically-heated vaporizing element positioned near to this inlet.

909,897. EXTERNAL ELECTRICAL VAPORIZER FOR COMBUSTION ENGINES. Harry Hertzberg, New York, N. Y., assignor to Abbot Augustus Low, Horseshoe, N. Y. Filed March 12, 1907. The electrically-heated chamber is outside of the cylinder.

909,898. INTERNAL ELECTRIC STARTING VAPORIZER FOR COMBUSTION ENGINES. Harry Hertzberg, New York, Abbot A. Low, Horseshoe, and August Wassmann, Astoria, N. Y.; said Hertzberg and Wassmann assignors to said Low. Filed April 16, 1907. In this case the chamber is within the cylinder.

909,899. ELECTRICAL VAPORIZER FOR INTERNAL-COMBUSTION ENGINES. Harry Hertzberg, New York, and Abbot A. Low, Horseshoe, N. Y.; said Hertzberg assignor to said Low. Original application filed February 11, 1907. This application filed April 16, 1907. A modification of No. 909,896, in which a cooling means is also provided.

909,900. ELECTRICALLY-HEATED STARTING VAPORIZER FOR INTERNAL-COMBUSTION ENGINES. Harry Hertzberg, New York, and Abbot A. Low, Horseshoe, N. Y.; said Hertzberg assignor to said Low. Original application filed February 11, 1907. Divided and this application filed April 16, 1907. Another modification of No. 909,896, in which several vaporizing units are provided.

909,917. ELECTRICALLY-OPERATED STARTING VAPORIZER FOR COMBUSTION ENGINES. Abbot A. Low, Horseshoe, N. Y. Filed June 8, 1907. Renewed December 1, 1908. The construction of a modified form of No. 909,896 is described.

909,935. PROTECTED INSULATOR. John H. B. Rea, La Fayette, Ga. Filed May 7, 1908. About the insulator is a metallic casing wholly surrounding its external surface and having the same general shape.

909,943. WIRE CONNECTOR. John M. Sahlin, Chicago, Ill. Filed February 11, 1907. Comprises duplicate members, formed of tapering sleeves, with semicircular openings, tapering-pointed tongues extending out from the thick side of the sleeve, spaced longitudinal grooves formed therein, and wires in the grooves, having their ends twisted and bearing against the end of the sleeves.

909,985. FIRE-EXTINGUISHING APPARATUS. Charles E. Buell, North Plainfield, N. J., assignor to General Fire Extinguisher Company, New York, N. Y. Filed August 2, 1897. Contains an electro-mechanical alarm adapted to be made operative by the turning of the valve.

909,987. PROCESS OF TREATING SUGAR-CANE AND SIMILAR SUBSTANCES. George D. Burton, Boston, Mass. Filed October 17, 1906. Consists in removing the juices, submerging the fibers in a bath containing sodium carbonate and animal grease and then passing through this a current while the fibers are immersed.

909,993. TROLLEY-WIRE SUPPORT. Charles G. Ette, St. Louis, Mo., assignor to Ette Investment Company, St. Louis, Mo. Filed May 4, 1908. A cast-metal shank is provided at its upper end with a head having integral lugs that lie on opposite sides of a support and an integral jaw and a co-operating movable jaw at the lower end of the shank to engage the wire.

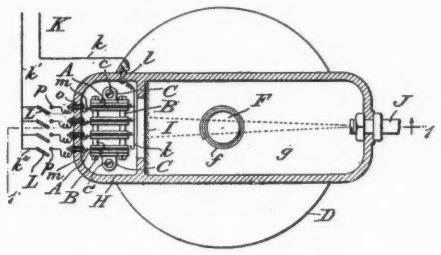
910,040. TRAIN-LINE COUPLING. William L. Bliss, Brooklyn, N. Y. Filed November 28, 1904. A combined hose and electric cable coupling.

910,042. MOTOR-CONTROLLING DEVICE. Charles E. Carpenter, New York, N. Y., assignor to the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed May 9, 1907. An electromagnetic switch is arranged to bridge a pair of contacts associated with the armature resistance and another pair shunted around the field resistance.

910,053. REGULATOR FOR MUSICAL INSTRUMENTS. William B. Fleming, Los Angeles, Cal. Filed July 28, 1904. Two independently moving music sheets are provided with a take-up roll that is electrically controlled.

910,058. ELECTRICAL CONTROLLING MECHANISM. Walter O. Haymond and John O. Potter, Muncie, Ind. Filed July 20, 1907. Consists of an electromagnet with two tandem coils and a reciprocatory armature operating therein and a circuit controller for the magnet, including a movable element engaged and operated by the armature.

910,092. CONTROLLER FOR RADIATOR VALVES. Frank A. Simonds, Grand Rapids, Mich., assignor to Simonds Heating and Specialty Company, Fremont, Mich. Filed March 24, 1906. A thermostat is provided with a solenoid having two independent coils connected to its opposite poles and means whereby the operation of the core of the solenoid actuates an air-vent-moving rod.



909,900—ELECTRIC VAPORIZER FOR GASOLINE ENGINES.

910,098. MOTOR CONTROLLER. Frank P. Townsend, Elyria, Ohio, assignor to the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed July 16, 1906. In combination with a rolling mill having two tables for carrying the work and passing it back and forth through the rolls, are two motors, one for each table, and controllers by means of which the motors may be run either alternately or simultaneously in the same or opposite directions.

910,112. ELECTRIC-LIGHT HANGER. James W. Carter, Abilene, Tex. Filed October 7, 1907. An adjustable pendant is provided with pulleys and a counterweight for the lamp.

910,118. FIRE-ALARM SIGNALING DEVICE. Frederick C. Crutchfield, Washington, D. C. Filed May 3, 1907. A circuit-closing and a circuit-opening spring are held by fusible means, that of the latter being more refractory than that of the former.

910,158. INCANDESCENT-ELECTRIC-LAMP HOLDER. Frank Walker, Los Angeles, Cal. Filed January 13, 1908. Consists of two wires, one engaging the neck of the lamp and the other pivoted to it and engaging the edge of a table.

910,161. TROLLEY. Willis J. Baker, Washington, D. C., assignor of one-half to William Fletcher Mitchell, Baltimore, Md. Filed January 29, 1907. Pivoted on each side of the wheel is a weighted guard having a protecting finger extending over the trolley wire.

910,165. TURBO GENERATOR. Ernst J. Berg, Schenectady, N. Y., assignor to General Electric Company. Filed September 7, 1907. A multi-stage steam turbine has three shafts, two running at relatively high speeds and driving induction alternators and the third at lower speed driving a synchronous alternator.

910,172. CLOTH-CUTTING MACHINE. Frederick J. Clark, Buffalo, N. Y., assignor to Eastman Machine Company, Buffalo, N. Y. Filed September 6, 1907. The knife is reciprocated by an electric motor, an electric lamp throwing light on the work.

910,176. ANTI-INDUCTION METHOD FOR TELEPHONE SYSTEMS. William Condon and Albert Barrett, Kansas City, Mo. Filed May 27, 1907. Consists in subjecting two portions of a secondary circuit to opposite and unequal inductive action by currents traversing a primary circuit.

910,177. ANTI-INDUCTION TELEPHONE SYSTEM. William Condon and Albert Barrett, Kansas City, Mo. Filed May 27, 1907. Relates to further details of the above.

910,184. RAILWAY SIGNAL SYSTEM. Charles E. Duffie, Omaha, Neb. Filed August 19, 1907. A number of normally closed, overlapping, independent signal circuits are opened and closed by a series of track circuits.

910,185. ELECTRIC-LAMP SOCKET. Victor E. Extrom and Charles H. Grundy, Tomahawk, Wis. Filed October 9, 1907. The socket has a branch tapped on one side and a key for making and breaking the circuit of either branch.

910,189. TELEPHONE ATTACHMENT. Joseph C. Fox, Seattle, Wash. Filed June 18, 1907. The telephone receiver is supported on an extended bracket so as to be near the ear of the user.

910,191. ELECTRIC HEATER. George V. K. Greene, New York, N. Y., assignor to E. Arden Noblett, New York, N. Y. Filed February 19, 1908. Consists of two plates fitting together at their edges with an air-tight joint, the lower plate having a continuous channel for the resistance wire.

910,197. OVERHEAD TROLLEY. James H. Howard, Kansas City, Kan. Filed September 11, 1907. A trolley-pole mount consists of two parts, one having a cam curving concentrically of its axis, which is engaged by a number of spring-actuated plungers carried by the other part and a trolley pole carried by the rotatable part and pressed upward by the plungers.

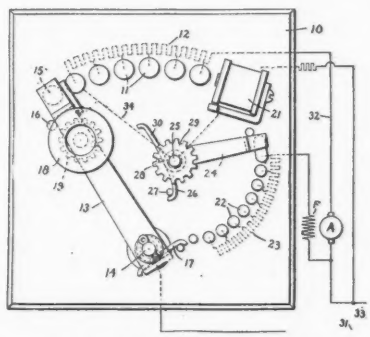
910,214. COMMUTATOR BRUSH. Chester B. Mills, Wilmerding, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed January 3, 1906. A carbon brush has a slotted outer edge and a strip of sheet metal so located in the slot that its edges are flush with the brush except at one end, which is provided with a connector.

910,222. LOCOMOTIVE ELECTRIC-ALARM SYSTEM. George Noreau, Quebec, Canada, assignor of one-half to Alexander Cummings, Quebec, Canada. Filed January 14, 1908. An electric bell is rung when the circuit through a third rail and a contact thereon carried by the locomotive is completed.

910,239. ELECTRIC SWITCH. Thomas M. Smith, New York, N. Y. Filed December 18, 1907. A resilient bow is arranged to have one end move in a groove so as to open and close the circuit.

910,241. ROSETTE. James S. Stewart, New York, N. Y., assignor to Annie Stewart, New York, N. Y. Filed December 23, 1907. Has an integral barrier and a cover plate recessed to co-operate with the barrier, whereby conductors may be clamped in the corners produced by the offset construction of the barrier.

910,243. MEANS FOR CONNECTING CONDUCTORS TO COMMUTATOR BRUSHES. Norman W. Storer, Pittsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed April 4, 1906. The brush has a cavity and a recess, a plate that covers the cavity and has a portion seated completely within the recess, and an expanded stud projecting from the plate and located in the cavity.



910,343.—MOTOR-CONTROLLING RHEOSTAT.

910,244. TELEPHONE RECEIVER. Harve R. Stuart, Wheeling, W. Va. Filed January 10, 1907. A pair of fixed magnets has one pole in common, their other poles being oppositely disposed with an armature substantially closing the gaps between the poles.

910,247. SAFETY DEVICE FOR ELEVATORS. Hugh Watson, Washington, D. C. Filed May 29, 1908. The doors of an elevator shaft are electrically controlled, a motor being connected to drive all of the door-operating mechanisms.

910,261. FLOOR-BOX FOR ELECTRIC-CONDUCTOR TERMINALS. Millard E. Ames and John H. Goehst, Chicago, Ill. Filed June 8, 1908. The box body is provided with a flaring annular rim, an adjustable ring being interposed between the cover and rim.

910,269. TEMPERATURE-REGULATING APPARATUS. Albert M. Butz, Oak Park, Ill.; Ella Elizabeth Butz, executrix of said Albert M. Butz, deceased, assignor to H. E. Bullock, Chicago, Ill. Filed July 12, 1904. A thermostat controls the circuits of an electric motor that operates the valve.

910,275. INCANDESCENT-ELECTRIC-LAMP TOOL. Elmer F. Dwyer, Lynn, Mass. Filed February 21, 1908. A tool for cutting or grasping filaments or wires within the bulb has a shaft with an eccentric bore containing an inner shaft, cutting edges being provided on the ends of both shafts.

910,287. INDICATOR FOR MOTOR CARRIAGES. Alexander M. Hudson, New York, N. Y. Filed December 6, 1907. A dial is provided with insulated contacts and a hand arranged to sweep the contacts successively, there being a circuit-breaking device and a stationary magnet in circuit with the hand and an armature for the magnet arranged to rotate with the hand.

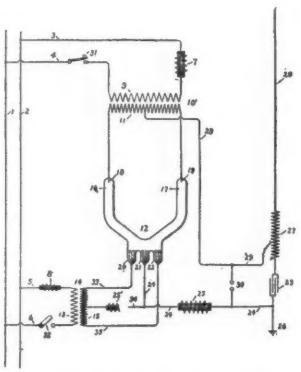
910,314. THREE-WIRE TELEPHONE SYSTEM. William Reid, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. Filed February 26, 1906. The third wire at the central office contains a cut-off and a supervisory relay.

910,315. MILLING MACHINE. John Riddell, Schenectady, N. Y., assignor to General Electric Company. Filed April 17, 1905. An electric motor supported on a column drives the machine.

910,328. KNIFE SWITCH. George B. Thomas, Bridgeport, Conn., assignor to the Bryant Electric Company, Bridgeport, Conn. Filed May 26, 1908. The blade has its hinging end split and offset to embrace the split end of a hinging post.

910,333. ELECTRIC SWITCH. Edmund B. Wedmore, Rugby, England, assignor to General Electric Company. Filed November 20, 1905. An oil can is shiftable to enclose the switch contacts.

910,343. MOTOR-CONTROLLING RHEOSTAT. William C. Yates, Schenectady, N. Y., assignor to General Electric Company. Filed July 3, 1907. The armature and shunt field resistances have each an independent contact arm, the one for the field being immovable till all armature resistance is cut out.



910,430.—WIRELESS-TELEGRAPH TRANSMITTER.

910,381. BATH CABINET. John Hermann, Saginaw, Mich. Filed March 25, 1907. Contains a number of electric lamps arranged in position to heat and light the patient, there being guards for the lamps comprising spraying pipes disposed between the lamps and seat.

910,387. RAILWAY SIGNAL. William H. Jordan, Brooklyn, N. Y., and George T. Hanchett, Hackensack, N. J., assignors to Jordan Automatic Signal Company, New York, N. Y. Original application filed June 14, 1905. Divided and this application filed May 31, 1907. The signals are actuated by the movement of plungers between pairs of opposed magnets.

910,412. ELECTRIC BELL. George L. Patterson, New York, N. Y., assignor to Alice C. Patterson, New York, N. Y. Filed October 17, 1907. Construction of an enclosed bell is described.

910,414. SPEED-LIMITING DEVICE FOR ELECTRICALLY-IGNITING EXPLOSIVE ENGINES. Frederic S. Perrin, New York, N. Y. Original application filed January 9, 1907. Divided and this application filed January 16, 1908. Contiguous contact points closing a primary circuit are adapted to be set at any point on the instrument scale, the index of the instrument separating the contacts points so as to open the primary circuit.

910,430. WIRELESS-TELEGRAPH TRANSMITTER. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. Filed April 20, 1907. Consists of a spark gap fed by periodic discharges of a condenser, a transmission line carrying low-potential alternating currents, a step-up transformer, a mercury-arc rectifier receiving discharges from the transformer and discharging into the condenser, and means for leveling the rectifier discharges.

910,433. TROLLEY WHEEL. Lewis J. Tetlow, Holyoke, Mass., assignor to New England Trolley Wheel Company, Holyoke, Mass. Filed June 5, 1908. The wheel has a chambered hub and a hollow shell held within the hub and rotatable therewith.

910,434. METHOD OF ELECTRIC WELDING. Charles E. Thompson, Cleveland, Ohio, assignor to the Electric Welding Products Company, Cleveland, Ohio. Filed June 11, 1907. The method of welding brass to steel consists in first reducing the cross section of the face of the brass part to about one-fifth of that of the steel part, bringing the faces into contact and then passing a current through them.

910,454. RAILWAY SIGNALING. Leonard M. Bracewell, Sewal, Iowa. Filed April 29, 1907. Comprises a service wire connected to the source of the electrical supply and extended along the side of the track, and a series of return wires each paralleling the service wire throughout a portion of its length.

910,474. ELECTRIC BELT. Abraham Hornung, Czarna, near Pilzno, and Isidor Sperling, Tarnopol, Austria-Hungary. Filed July 12, 1907. A band is fastened about the wrist and provided with contacts arranged at intervals, controlled by the hands of a watch, to send an electric current through the flesh.

910,478. RHEOSTAT. William C. Yates, Schenectady, N. Y., assignor to General Electric Company. Filed July 29, 1907. A number of automatically-operated rheostats are connected so that one of them starts another of the series after a predetermined movement.

910,479. ELECTRIC HEATER. William S. Andrews, Schenectady, N. Y., assignor to General Electric Company. Filed January 15, 1908. Comprises a body portion, a self-contained heating unit, a support for this and means for locking the support to the body to secure the unit rigidly between the parts.

910,481. ARC LAMP. Richard Fleming, Lynn, Mass., assignor to General Electric Company. Filed December 28, 1905. A non-consuming copper arc-lamp electrode has a number of supporting wings with large heat-radiating surfaces projecting laterally from the rod.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired January 26, 1909:

467,504. ELECTRIC SWITCH. H. J. Haight, New York, N. Y.
467,505. ELECTRIC INDICATING INSTRUMENT. H. J. Haight, New York, N. Y.
467,509 and 467,510. ELECTRIC DRILL SYSTEM. H. N. Marvin, Syracuse, N. Y.
467,523. INCANDESCENT ELECTRIC LAMP. E. P. Roberts, Cleveland, Ohio.
467,537. ALTERNATING-CURRENT MOTOR. L. Gutmann, Pittsburg, Pa.
467,538. ELECTRIC HEATER. L. Gutmann, Pittsburg, Pa.
467,540. ELECTRIC SWITCH. C. J. Klein, New York, N. Y.
467,543 and 467,544. APPARATUS FOR CHARGING SECONDARY BATTERIES. C. O. Mailloux, New York, N. Y.
467,545. CHARGING SECONDARY BATTERIES. C. O. Mailloux, New York.
467,546 and 467,547. APPARATUS FOR CHARGING SECONDARY BATTERIES. C. O. Mailloux, New York.
467,551. AUTOMATIC ELECTRIC CONTROLLER FOR AIR PUMPS. A. Bergmann, New York, N. Y.
467,573. SECONDARY BATTERY. J. B. Entz, New York, and W. A. Phillips, Brooklyn, N. Y.
467,581. ELECTRIC RAILWAY SIGNALING APPARATUS. F. I. Myers, New York, N. Y.
467,610. ELECTRIC ARC LAMP. J. A. Mosher, Abilene, Kan.
467,611. RHEOSTAT. J. A. Mosher, Abilene, Kan.
467,650. APPARATUS FOR LAYING UNDERGROUND CONDUITS FOR ELECTRIC WIRES. H. B. Camp, Cuyahoga Falls, Ohio.
467,651. ELECTRICAL SIGNALING APPARATUS. P. B. Delaney, South Orange, N. J.
467,656. ELECTRIC ARC LAMP. C. E. Scribner, Chicago, Ill.
467,669. METER FOR ELECTRIC TRANSLATING DEVICES. H. H. Cutler, Newton, Mass.
467,773. REGULATION OF ELECTRIC CIRCUITS. F. B. Rae, Detroit, Mich.
467,774. ELECTRIC TELL-TALE FOR TANKS. C. Reuter and G. Bollmann, Brooklyn, N. Y.
467,897. SYSTEM OF ELECTRIC DISTRIBUTION. N. W. Perry, Cincinnati, O.
467,901. TEST-CIRCUIT FOR MULTIPLE SWITCHBOARDS. C. E. Scribner, Chicago, Ill.